

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH
LIBRARY



Class No.

Book No.

23477

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 85

JULY-DECEMBER 1941



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1942

U. S. DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

UNDER SECRETARY—Paul H. Appleby

ASSISTANT SECRETARY—Grover B. Hill

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹

ALASKA—*College*: L. T. Oldroyd.¹

ARIZONA—*Tucson*: P. S. Burgess.¹

ARKANSAS—*Fayetteville*: W. R. Horlacher.¹

CALIFORNIA—*Berkeley*: C. B. Hutchison.¹

COLORADO—*Fort Collins*: H. J. Henney.¹

CONNECTICUT—

[New Haven] Station: *New Haven*; W. L. Slate.¹

Storrs Station: *Storrs*; E. G. Woodward.¹

DELAWARE—*Newark*: G. L. Schuster.¹

FLORIDA—*Gainesville*: W. Newell.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*; S. H. Starr.¹

HAWAII—*Honolulu*: J. H. Beaumont.¹

IDAHO—*Moscow*: E. J. Iddings.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: E. J. Reed.¹

IOWA—*Ames*: R. B. Buchanan.¹

KANSAS—*Manhattan*: L. E. Call.¹

KENTUCKY—*Lexington*: T. P. Cooper.¹

LOUISIANA—*University Station, Baton Rouge*:
W. G. Taggart.¹

MAINE—*Orono*: F. Griffec.¹

MARYLAND—*College Park*: R. B. Corbett.¹

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹

MISSISSIPPI—*State College*: C. Dorman.¹

MISSOURI—

College Station: *Columbia*; M. F. Miller.¹

Fruit Station: *Mountain Grove*; P. H. Shepard.¹

Poultry Station: *Mountain Grove*; T. W. Noland.¹

MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹

NEVADA—*Reno*: S. B. Doten.¹

NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹

NEW JERSEY—*New Brunswick*: W. H. Martin.¹

NEW MEXICO—*State College*: Fabian Garcia.¹

NEW YORK—

State Station: *Geneva*; A. J. Heinicke.¹

Cornell Station: *Ithaca*; C. E. F. Guter-
man.¹

NORTH CAROLINA—*State College Station*,
Raleigh: L. D. Bayer.¹

NORTH DAKOTA—*State College Station, Fargo*:
H. L. Walster.¹

OHIO—*Wooster*: Edmund Secrest.¹

OKLAHOMA—*Stillwater*: W. L. Blizard.¹

OREGON—*Corvallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: S. W. Fletcher.¹

PUERTO RICO—

Federal Station: *Mayaguez*; Atherton
Lee.¹

Insular Station: *Rio Piedras*; J. A. B.
Nolla.¹

RHODE ISLAND—*Kingston*: M. H. Campbell.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. A. Moore.¹

TEXAS—*College Station*: A. B. Conner.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. E. Carrigan.¹

VIRGINIA—

Blacksburg: A. W. Drinkard, Jr.¹

Truck Station: *Norfolk*; H. H. Zimmer-
ley.¹

WASHINGTON—

College Station: *Pullman*; E. C. Johnson.¹

Western Station: *Puyallup*; J. W. Kal-
kus.¹

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

WISCONSIN—*Madison*: C. L. Christensen.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Superintendent

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENT'S

- Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS
 Agricultural Meteorology—F. V. RAND.
 Soils and Fertilizers—H. C. WATERMAN
 Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
 Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology W. A. HOOKER, F. ANDRE
 Animal Husbandry—G. HAINES.
 Dairying and Dairy Farming—H. C. ELTING.
 Veterinary Medicine—W. A. HOOKER.
 Agricultural Engineering—H. C. WATERMAN.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH,
 GEORGIAN ADAMS.
 Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
 Indexes—MARTHA C. GUNDELOCH.
 Bibliographies—CORA L. FELDkamp.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 85

EDITORIALS

	Page
The National Nutrition Conference for Defense and its significance for the experiment stations.....	1
The agricultural experiment stations in 1940.....	145
The Federal Office of Scientific Research and Development.....	289
Industrial research in the United States, by R. Y. Winters.....	433
Some additional bibliographic aids in agricultural research.....	577
Twenty years of the U. S. D. A. Graduate School.....	721

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:	Page	ARIZONA STATION:	Page
Bulletin 249.....	552	Technical Bulletin 88.....	120
Bulletin 250.....	678	Technical Bulletin 89.....	57
Leaflet 19.....	547	Technical Bulletin 90.....	281
Annual Report 1939.....	445,	Technical Bulletin 91.....	591
464, 470, 477, 484, 487, 499,	515,	Bulletin 171..... 181, 190, 257,	286
523, 539, 542, 564, 566, 575.		Bulletin 172.....	232

	Page		
ARIZONA STATION Continued		DELAWARE STATION Continued	
Bulletin 173.....	168	Bulletin 228	548
Annual Report, 1940.....	589,	Bulletin 220.....	593
608, 619, 628, 641, 650, 655, 664,		FLORIDA STATION:	
675, 676, 693, 717.		Bulletin 352.....	187
ARKANSAS STATION:		Bulletin 353	200
Bulletin 107	472	Bulletin 354.....	241
Bulletin 108.....	612	Bulletin 355.....	475
Bulletin 400	612	Bulletin 356.....	652
Bulletin 410	634	Bulletin 357.....	644
Bulletin 411	653	Bulletin 358.....	651
Bulletin 413.....	813	Bulletin 359.....	802
CALIFORNIA STATION:		Annual Report 1940	588,
Bulletin 640.....	833	589, 596, 604, 608, 619, 620, 641,	
Bulletin 642	686	651, 665, 675, 677, 691, 717	
Bulletin 645	94	GEORGIA STATION:	
Bulletin 646.....	191	Bulletin 208.....	51
Bulletin 647.....	369	Bulletin 209.....	196
Bulletin 648.....	618	Bulletin 210.....	552
Illgandia—		Bulletin 211.....	659
Vol. 13—		Bulletin 212.....	693
No. 8, Jan. 1941.....	364	Bulletin 213.....	725, 726, 757
No. 9, Jan. 1941.....	222, 223	Bulletin 214.....	756
No. 10, Jan. 1941.....	492, 494, 498	Bulletin 215.....	762
No. 11, Apr. 1941.....	818, 927	Bulletin 216.....	802
Vol. 14, No. 1, May 1941.....	765	Bulletin 217.....	765
Mimeographed Report 74.....	681	Circular 126.....	185
Mimeographed Report 75.....	682	Circular 127	341
Mimeographed Report 76.....	688	Circular 128	855
[Biennial] Report 1939-40.....	5,	Circular 130	792
13, 40, 49, 52, 62, 65, 83, 104,		HAWAII STATION:	
115, 117, 126, 143		Report 1940	160,
COLORADO STATION:		181, 190, 204, 218, 231, 238,	
Bulletin 464.....	14	247, 268, 286.	
Bulletin 465.....	219	IDAHO STATION:	
Bulletin 466.....	616	Bulletin 238.....	71
Bulletin 467.....	693	Bulletin 239 (Annual Report	
Press Bulletin 94.....	362	1940).....	724,
Colorado Farm Bulletin, vol-		720, 750, 761, 769, 786, 800,	
ume 3—		809, 815, 828, 829, 855, 864	
No. 2, Apr.-June 1941.....	473,	Bulletin 240.....	802
476, 488, 512, 541, 555, 550		Circular 82.....	430
No. 3, July-Sept. 1941	754,	Circular 83	802
761, 782, 806, 822, 847, 863		ILLINOIS STATION	
CONNECTICUT [NEW HAVEN] STATION:		Bulletin 471.....	46
Bulletin 442.....	202	Bulletin 472.....	15
Bulletin 443.....	652	Bulletin 473.....	54
Bulletin 444.....	729, 759, 776, 786	Bulletin 474.....	44
DELAWARE STATION:		Bulletin 475.....	653
Bulletin 227 (Annual Report		Bulletin 476.....	360
1940).....	5, 13, 40, 47, 65,	Bulletin 477.....	686
84, 95, 100, 117, 143			

INDIANA STATION:		Page	LOUISIANA STATION—Continued		Page
Bulletin 453		830	Bulletin 333		842
Bulletin 454		831	Mimeographed Circular 12		678
Bulletin 455		836	Fruit and Truck Station Bi-		
Bulletin 456		834	ennial Report 1939-40		751,
Bulletin 457		812			761, 709, 810, 820
Bulletin 458		761	North Louisiana Station Bi-		
Bulletin 459		834	ennial Report 1939-40		752,
Circular 258		103			762, 809, 864
Circular 259		761	Rice Station Biennial Report		
Circular 260		812	1939-40		729,
Circular 261		758			752, 772, 801, 810, 864
Circular 262		735	MAINE STATION:		
Circular 263		804	Bulletin 400 (Report 1940)		588,
Circular 264		751	593, 609, 619, 629, 642, 681, 691,		
IOWA STATION:			716, 717.		
Research Bulletin 285		102	Bulletin 403		222
Research Bulletin 287		772	Bulletin 404		681
Bulletin P19, new series		45	Miscellaneous Publication		
Bulletin P20, new series		91	550		46
Bulletin P21, new series		121	Miscellaneous Publication		
Annual Report 1940, part 1		151,	560		49
160, 171, 176, 182, 190, 201, 205, 217,			Miscellaneous Publication		
218, 231, 238, 247, 257, 262, 265,			561		342
268, 283, 284, 285, 286.			Official Inspections 178		477, 479
Annual Report 1940, part 2		151,	MARYLAND STATION:		
160, 184, 192, 205, 218, 233, 257,			Bulletin 436		551
263, 286.			Bulletin 437		410
KANSAS STATION:			Bulletin 438		554
Bulletin 292		45	Bulletin 439		795
Bulletin 293		753	Annual Report 1940		154,
Technical Bulletin 51		94	160, 168, 178, 182, 190, 205, 218,		
Circular 204		622	231, 239, 248, 257, 263, 286.		
Biennial Report 1939		5, 13, 40, 47,	MASSACHUSETTS STATION:		
65, 84, 92, 98, 104, 116, 117, 121,			Bulletin 377		35
125 142, 143.			Bulletin 378 (Annual Report		
KENTUCKY STATION:			1940)		724,
Bulletin 410		53	729, 739, 752, 762, 769, 786, 804,		
Bulletin 411		687	800, 815, 828, 830, 845, 864.		
Bulletin 412		645	Control Series Bulletin 107		180
Annual Report 1940, part 1		725,	MICHIGAN STATION:		
747, 751, 761, 769, 786, 801, 810,			Special Bulletin 306		311
815, 829, 840, 852, 864.			Special Bulletin 307		783
Annual Report 1940, part 2		864	Special Bulletin 308		545
LOUISIANA STATION:			Special Bulletin 309		833
Bulletin 327		45	Technical Bulletin 175		14
Bulletin 328		266	Technical Bulletin 176		24
Bulletin 329		264	Technical Bulletin 177		529
Bulletin 330		96	Circular 177		621
Bulletin 331		196			

MICHIGAN STATION—Continued.		Page	MISSOURI STATION :		Page
Quarterly Bulletin, vol. 23—			Bulletin 422	-----	688
No. 3, Feb. 1941		184,	Bulletin 423	-----	388
185, 194, 216, 222, 227,		234,	Bulletin 424	-----	508
235, 241, 253, 261, 264,		265	Bulletin 425	-----	386
No. 4, May 1941		613,	Bulletin 426	-----	544
615, 622, 627, 643, 653, 655,			Bulletin 427	-----	689
657, 658, 665, 670, 676, 683,			Bulletin 428	-----	764
685, 687.			Bulletin 429	-----	739
Annual Report 1940		717	Research Bulletin 323	-----	246
[Biennial] Report 1939-40		22,	Research Bulletin 324	-----	679
65, 84, 101, 115, 119, 120, 143			Research Bulletin 325	-----	256
			Research Bulletin 326	-----	330
			Research Bulletin 327	-----	835
			Research Bulletin 328	-----	801
			Circular 211	-----	215
MINNESOTA STATION :			MISSOURI FRUIT STATION :		
Bulletin 351		839	Bulletin 30	-----	622
Bulletin 352		837	MONTANA STATION :		
Technical Bulletin 145		232	Bulletin 385	-----	118
Technical Bulletin 146		828	Bulletin 386	-----	211
Annual Report 1940		581,	Bulletin 387	-----	168
582, 640, 643, 644, 647, 648, 675,			Bulletin 388	-----	473
676, 717.			Bulletin 389	-----	646
			Bulletin 390	-----	705
			Bulletin 391	-----	830
			Bulletin 392	-----	757
			Circular 161	-----	73
			Circular 162	-----	507
MISSISSIPPI STATION :			NEBRASKA STATION :		
Bulletin 351		234	Bulletin 330	-----	260
Bulletin 352		550	Bulletin 331	-----	614
Bulletin 353		545	Bulletin 332	-----	539
Bulletin 354		624	Research Bulletin 121	-----	734
Bulletin 355		479	Circular 67	-----	44
Bulletin 357		341	Circular 68	-----	184
Bulletin 358		342	NEVADA STATION :		
Circular 101		547	Bulletin 155	-----	338
Circular 102		354	Annual Report 1940	-----	444,
Mississippi Farm Research—			445, 472, 516, 527, 542, 575		
Vol. 3—			NEW HAMPSHIRE STATION :		
No. 11, Nov. 1940		41,	Bulletin 329	-----	23
51, 52, 142, 143			Circular 57	-----	46
No. 12, Dec. 1940		336,	Scientific Contribution 79	-----	158
345, 346, 353, 383, 430			Scientific Contribution 82	-----	365
Vol. 4—			NEW JERSEY STATIONS :		
No. 1, Jan. 1941		292,	Bulletin 686	-----	191
312, 344, 347, 348, 383,			Bulletin 687	-----	518
410, 430.			Bulletin 688	-----	243
No. 2, Feb. 1941		336,			
344, 353, 383, 410, 412, 430					
No. 3, Mar. 1941		470,			
502, 515, 522, 523, 547					
No. 4, Apr. 1941		450,			
470, 479, 515, 552, 575					
No. 5, May 1941		448,			
470, 479, 481, 493, 502,					
517, 551, 552, 556.					
Annual Report 1940		845, 864			

NEW JERSEY STATIONS—Con.		Page	[NEW YORK] CORNELL STATION:		Page
Bulletin 689	-----	545	Bulletin 741	-----	837
Bulletin 690	-----	783	Bulletin 742	-----	72
Circular 404	-----	228	Bulletin 743	-----	285
Circular 405	-----	215	Bulletin 744	-----	837
Circular 406	-----	22	Bulletin 745	-----	61
Circular 407	-----	168	Bulletin 746	-----	20
Circular 408	-----	184	Bulletin 747	-----	260
Circular 409	-----	480	Bulletins 748-750	-----	609
Circular 410	-----	359	Bulletin 751	-----	407
Circular 411	-----	362	Bulletin 752	-----	633
Circular 412	-----	368	Memoir 232	-----	220
Circular 413	-----	796	Memoir 233	-----	207
Circular 414	-----	763	Memoir 234	-----	778
Circular 415	-----	775	Memoir 235	-----	744
Hints to Poultrymen—					
Vol. 27—			NEW YORK STATE STATION:		
No. 5, June-July			Bulletin 697	-----	393
1940	-----	254	Technical Bulletin 236	-----	153
No. 6, Aug.-Sept.			Technical Bulletin 257	-----	245
1940	-----	254	Technical Bulletin 258	-----	298
Vol. 28—			Technical Bulletin 259	-----	814
No. 1 Nov.-Dec. 1940	-----	237	Circular 191	-----	193
No. 2, Dec. 1940-Jan.			Farm Research, vol. 7—		
1941	-----	467	No. 2, Apr. 1, 1941	-----	153,
No. 3, Feb.-Mar.			166, 195, 196, 208, 209, 215,		
1941	-----	6	219, 227, 246.		
No. 4, Apr.-May			No. 3, July 1, 1941	-----	735,
1941	-----	804	756, 761, 763, 764, 765, 770,		
No. 5, June-July			789, 794, 810, 847.		
1941	-----	8	NORTH CAROLINA STATION:		
Nursery Disease Notes, vol.			Bulletin 329	-----	553
13—			Technical Bulletin 66	-----	41
No. 6, Dec. 1940	-----	78	Technical Bulletin 67	-----	194
No. 10, Apr. 1941	-----	638	Agronomy Information Cir.		
No. 11, May 1941	-----	638	129	-----	184
No. 12, June 1941; vol. 14,					
No. 1, July 1941	-----	782	NORTH DAKOTA STATION:		
Plant Disease Notes, vol. 18—			Bulletin 295	-----	72
No. 11, Feb. 1941	-----	783	Bulletin 296	-----	70
No. 12, Mar. 1941	-----	776	Bimonthly Bulletin, vol. 3—		
NEW MEXICO STATION:			No. 3, Jan. 1941	-----	42,
Bulletin 274	-----	684	47, 52, 69, 83, 117		
Bulletin 275	-----	623	No. 4, Mar. 1941	-----	186,
Bulletin 276	-----	390	188, 189, 209, 218, 219, 261,		
Bulletin 277	-----	886	263, 286.		
Bulletin 278	-----	613	No. 5, May 1941	-----	476,
Bulletin 279	-----	753	485, 494, 506, 555		
Bulletin 280	-----	756	No. 6, July 1941	-----	754,
Bulletin 281	-----	763	757, 758, 771, 774, 824, 839,		
Annual Report 1940	-----	161,	842, 847.		
182, 191, 205, 219, 231, 239, 253,			OHIO STATION:		
263, 268, 286.			Bulletin 618	-----	194
			Bulletin 619	-----	616

TENNESSEE STATION—Continued.		Page	PENNSYLVANIA STATION:		Page
Bulletin 620.....		765	Bulletin 402.....		60
Special Circular 61.....		186	Bulletin 403.....		754
Bimonthly Bulletin 209.....		445,	Bulletin 404.....		811
450, 479, 481, 482, 484, 489, 517,			Bulletin 405.....		742
518, 547, 548.			Bulletin 406.....		793
Bimonthly Bulletin 210.....		764,	Bulletin 407.....		803
781, 795, 803, 805, 808,		830	Bulletin 409.....		837
Ohio Forest News, No. 38,			Bulletin 410.....		803
July 1941.....		767	Journal Series Paper 915.....		262
(OKLAHOMA STATION:			PUERTO RICO STATION:		
Bulletin 246.....		224	Circular 23.....		85
Bulletin 247.....		473	Report 1938 (Spanish ed.)...		286
Bulletin 248.....		615	PUERTO RICO UNIVERSITY STATION:		
Circular 91.....		47	Bulletin 57 (Spanish ed.).....		848
Circular 92.....		681	Bulletin 59.....		849
Circular 93.....		474	Research Bulletin 1.....		730
Circular 94.....		616	Journal of Agriculture of the		
Circular 95.....		505	University of Puerto Rico—		
Mimeographed Circular 33			Vol. 24, No. 4, Oct. 1940...		730,
(rev.).....		205			731, 821
Current Farm Economics,			Vol. 25, No. 1, Jan. 1941...		798,
vol. 14—					799
No. 1, Feb. 1941.....		677	RHODE ISLAND STATION:		
No. 2, Apr. 1941.....		677	Bulletin 277.....		733
No. 3, June 1941.....		677	Miscellaneous Publication 9...		500
No. 4, Aug. 1941.....		830	Annual Fertilizer Circular,		
OREGON STATION:			1941.....		314
Bulletin 373.....		549	Annual Report [1940].....		729,
Bulletin 374.....		194	730, 739, 753, 762, 770, 787, 805,		
Bulletin 375.....		552	810, 815, 830, 842, 853, 864.		
Bulletin 376.....		244	SOUTH CAROLINA STATION:		
Bulletin 377.....		553	Bulletin 332.....		678
Bulletin 378.....		685	Annual Report 1940.....		13,
Bulletin 379.....		245	42, 48, 65, 84, 92, 98, 104, 115,		
Bulletin 380.....		240	118, 125, 143.		
Bulletin 381.....		549	SOUTH DAKOTA STATION:		
Bulletin 382.....		216	Bulletin 346.....		550
Bulletin 383.....		243	Bulletin 347.....		690
Bulletin 384.....		487	Bulletin 348.....		690
Bulletin 385.....		201	Circular 32.....		757
Bulletin 386.....		804	TENNESSEE STATION:		
Bulletin 387.....		730	Bulletin 173.....		551
Bulletin 389.....		791	Bulletin 174.....		226
Bulletin 390.....		832	Bulletin 175.....		210
Bulletin 391.....		832	Bulletin 176.....		593
Bulletin 392.....		832	Circular 73.....		75
Bulletin 393.....		762	Circular 74.....		557
Circular 136.....		801	Circular 75.....		479
Circular 137.....		802			
Circular 138.....		808			
Circular 139.....		806			

TENNESSEE STATION—Continued.		Page	VIRGINIA STATION—Continued.		Page
Agricultural Economics and Rural Sociology Department—			Bulletin 331.....		838
Monographs 119-120.....		685	Bulletin 332.....		637
Monograph 122.....		410	Bulletin 333.....		611
Monograph 124.....		685	Technical Bulletin 68.....		669
Monograph 126.....		685	Technical Bulletin 69.....		708
Monograph 127.....			VIRGINIA TRUCK STATION:		
Monograph 128.....			Bulletin 106.....		312
Annual Report 1939.....		437,	WASHINGTON STATION:		
445, 470, 477, 487, 502, 516, 521,			Bulletin 391.....		680
542, 555, 575.			Bulletin 392.....		23
			Bulletin 393.....		548
			Bulletin 394 (Annual Report 1940).....		444,
			445, 471, 477, 487, 503, 516,		
			521, 527, 542, 556, 575.		
			Bulletin 395.....		593
			Popular Bulletin 160.....		116
TEXAS STATION:			WEST VIRGINIA STATION:		
Bulletin 596.....		51	Bulletin 299.....		689
Bulletin 597.....		448	Bulletin 300.....		625
Bulletin 598.....		535	Bulletin 301.....		831
Bulletin 599.....		385	WESTERN WASHINGTON STATION:		
Bulletin 600.....		388	Report 1940.....		446,
Bulletin 601.....		623	466, 471, 478, 488, 503, 518, 521,		
Bulletin 602.....		758	539, 542, 556, 575.		
Circular 91.....		357	WISCONSIN STATION:		
Circular 92.....		504	Bulletin 451 (Annual Report 1940, part 2).....		446,
UTAH STATION:			453, 471, 478, 485, 488, 503, 516,		
Bulletin 295.....		95	521, 537, 575.		
Bulletin 296.....		341	Research Bulletin 133.....		680
Bulletin 297.....		646	Research Bulletin 139.....		689
Bulletin 298.....		716	WYOMING STATION:		
Bulletin 299.....		637	Bulletin 243.....		43,
Circular 115.....		204	48, 62, 93, 99, 115, 143		
Circular 116.....		592	Bulletin 244.....		362
Circular 117.....		618	Bulletin 245.....		362
Farm and Home Science, vol. 2—			Bulletin 246.....		340
No 1, Mar. 1941.....		168, 191	Bulletin 247.....		653
192, 202, 214, 239, 258, 264			Bulletin 248.....		655
No 2, June 1941.....		613, 614,	Index Bulletin I, July 1941.....		864
615, 642, 690, 717			Annual Report 1940.....		13,
VERMONT STATION:			43, 48, 69, 91, 93, 99, 105, 115, 118,		
Bulletin 469.....		143	122, 143.		
Bulletin 470.....		863			
Bulletin 471.....		764			
Bulletin 472.....		7			
VIRGINIA STATION:					
Bulletin 329.....		616			
Bulletin 330.....		611			

UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED

Technical Bulletin—	Page	Technical Bulletin—Continued.	Page
731.....	50	742.....	203
734.....	31	743.....	229
735.....	44	744.....	512

Technical Bulletin—Continued.	Page	Farmers' Bulletin—Continued.	Page
745.....	307	1873.....	285
746.....	367	1875.....	620
747.....	839	1876.....	483
748.....	6	1877.....	862
749.....	11	1878.....	774
750.....	684	1880.....	789
751.....	683		
752.....	14	Circular—	
753.....	58	564.....	183
754.....	450	574.....	57
755.....	834	579.....	54
756.....	104	580.....	35
757.....	229	581.....	59
758.....	314	582.....	637
759.....	366	583.....	97
760.....	49	584.....	74
761.....	189	585.....	46
762.....	226	586.....	203
763.....	202	587.....	546
764.....	682	588.....	17
765.....	177	589.....	56
767.....	625	590.....	142
768.....	237	591.....	63
769.....	314	592.....	115
770.....	411	593.....	649
771.....	546	594.....	227
772.....	175	595.....	50
773.....	625	596.....	50
774.....	505	597.....	56
775.....	648	598.....	261
776.....	621	599.....	543
778.....	647	600.....	511
779.....	639	601.....	545
780.....	154	602.....	505
		603.....	409
Farmers' Bulletin—			
1028.....	195	Leaflet—	
1522.....	194	204.....	122
1854.....	211	205.....	89
1855.....	201	206.....	61
1856.....	227	207.....	114
1860.....	638	208.....	202
1861.....	505	209.....	74
1862.....	360		
1863.....	222	Miscellaneous Publication—	
1864.....	165	369.....	730
1865.....	143	390.....	62
1866.....	513	395.....	690
1867.....	342	398.....	286
1868.....	500	400.....	22
1869.....	547	402.....	284
1871.....	253	403.....	122
1872.....	624	405.....	270
		406.....	631

	Page		Page
Miscellaneous Publication—Con.		BUREAU OF AGRICULTURAL	
409.....	239	ECONOMICS—Continued.	
410.....	231	The German Settlement in	
413.....	64	Cullman County, Alabama,	
414.....	624	An Agricultural Island in	
415.....	284	the Cotton Belt.....	843
417.....	228	AGRICULTURAL MARKETING SERV-	
419.....	143	ICE:	
420.....	690	Cotton Quality Statistics,	
427.....	430	United States, 1939-40.....	684
430.....	270	BUREAU OF ANIMAL INDUSTRY:	
431.....	844	Regional Conferences on the	
432.....	862	National Poultry Improve-	
450.....	717	ment Plan, June 1940.....	95
Inventory—		COMMODITY CREDIT CORPORATION:	
127.....	168	Report of the President of	
128.....	168	the Commodity Credit Cor-	
129.....	595	poration, 1940.....	840
Crops and Markets—		BUREAU OF ENTOMOLOGY AND PLANT	
Vol. 17, No. 12, Dec. 1940.....	687	QUARANTINE:	
Vol. 18—		E-515-517, 519-521, 523-540..	501
No. 1, Jan. 1941.....	687	E-522.....	491
No. 2, Feb. 1941.....	687	EET-158-164.....	501
No. 3, Mar. 1941.....	687	Review of United States Pat-	
No. 4, Apr. 1941.....	687	ents Relating to Pest Con-	
No. 5, May 1941.....	687	trol, vol. 13, Nos. 1-12,	
No. 6, June 1941.....	687	Jan.-Dec. 1940.....	219
Water Facilities Area Planning		Recommendations for the	
Handbook.....	258	Control of Tobacco Insects	
Water Facilities Procedure		for the Season 1941.....	86
Manual.....	258	FEDERAL SURPLUS COMMODITIES	
OFFICE OF EXPERIMENT STATIONS:		CORPORATION:	
Report on the Agricultural		Report of Federal Surplus	
Experiment Stations,		Commodities Corporation	
1940.....	286	for the Fiscal Year 1940....	687
EXTENSION SERVICE:		FOOD AND DRUG ADMINISTRATION:	
Leaders on the Land; A Re-		Report of the Chief of the	
port of Cooperative Exten-		Food and Drug Adminis-	
sion Work in Agriculture		tration, 1940.....	411
and Home Economics in		OFFICE OF FOREIGN AGRICULTURAL	
1939.....	267	RELATIONS:	
AGRICULTURAL ADJUSTMENT		F. S. 85.....	840
ADMINISTRATION:		F. S. 86.....	840
Round the World with		Foreign Agriculture, vol. 5—	
Cotton.....	680	No. 1, Jan. 1941.....	119
BUREAU OF AGRICULTURAL		Nos. 2-6, Feb.-June 1941..	678
ECONOMICS:		FOREST SERVICE:	
Agricultural Economics Bibli-		Caribbean Forester, vol. 2—	
ography, No. 91.....	835	No. 1, Oct. 1940.....	23
Publications Dealing With		No. 2, Jan. 1941.....	23
Farm Management: 1903-			
June 30, 1940.....	678		

	Page		Page
FOREST SERVICE—Continued.		BUREAU OF PLANT INDUSTRY—Con.	
Fire Control Notes, vol. 5—		Plant Disease Reporter—Con.	
No. 1, Jan. 1941-----	64	Sup. 127, 1939-----	769
No. 2, Apr. 1941-----	204	Arizona Localities of Interest	
No. 3, July 1941-----	627	to Botanists-----	170
BUREAU OF PLANT INDUSTRY:		Contributions Toward a Flora	
[Soil Survey Report]—		of Nevada.—I, Gramineae	
Series 1933—		of Nevada-----	171
No. 36-----	590	The Pecos River Joint Inves-	
Series 1935—		tigation, 1939-1940: Soil	
No. 15-----	590	Salinity Investigation-----	310
No. 16-----	303		
No. 17-----	303	SOIL CONSERVATION SERVICE:	
No. 18-----	590	Erosion Survey—	
No. 19-----	590	No. 15-----	733
No. 20-----	730	No. 17-----	733
Series 1936—		No. 18-----	733
No. 4-----	303	No. 19-----	733
No. 5-----	303	No. 20-----	733
No. 6-----	303	SOS-TP-38-----	164
No. 7-----	590	Better Harvests Through	
Series 1937—		Conservation Farming-----	591
No. 1-----	303	Plowing for Terrace Main-	
No. 2-----	303	tenance in the South-----	258
Series 1938—		Soils and Security-----	590
No. 1-----	303	Terrace Construction With	
Plant Disease Reporter—		Small Equipment in the	
Vol. 25—		South-----	258
No. 4, Mar. 1, 1941---	64	The Work of the Soil Conser-	
No. 5, Mar. 15, 1941---	64	vation Service-----	590
No. 6, Apr. 1, 1941---	204		
No. 7, Apr. 15, 1941---	204	WEATHER BUREAU:	
No. 8, May 1, 1941---	357	Monthly Weather Review—	
No. 9, May 15, 1941---	357	Sup. 36, 1937-----	12
No. 10, June 1, 1941---	628	Sup. 38, 1938-----	13
No. 11, June 15, 1941---	628	Sup. 39, 1940-----	11
No. 12, July 1, 1941---	768	Sup. 40, 1940-----	13
No. 13, July 15, 1941---	768	Sup. 41, 1939-----	13

JOURNAL OF AGRICULTURAL RESEARCH

Vol. 61—	Page	Vol. 62—Continued.	Page
No. 7, Oct. 1, 1940-----	21, 33, 43	No. 5, Mar. 1, 1941-----	474, 517
No. 8, Oct. 15, 1940-----	39, 99	No. 6, Mar. 15, 1941-----	592,
No. 9, Nov. 1, 1940-----	183, 215, 234	620, 624, 651, 692	
No. 10, Nov. 15, 1940-----	175,	No. 7, Apr. 1, 1941-----	596,
	193, 221, 268	601, 620, 653	
No. 11, Dec. 1, 1940-----	187, 188, 221	No. 8, Apr. 15, 1941-----	725,
No. 12, Dec. 15, 1940-----	209,	760, 773, 777, 791	
	210, 232, 233, 234	No. 9, May 1, 1941-----	762,
Vol. 62—		780, 797, 803	
No. 1, Jan. 1, 1941-----	343, 360, 371	No. 10, May 15, 1941-----	724,
No. 2, Jan. 15, 1941-----	358, 372, 373, 379	746, 750, 773, 782	
No. 3, Feb. 1, 1941-----	454, 486, 491	No. 11, June 1, 1941-----	772, 781
No. 4, Feb. 15, 1941-----	458, 491, 495	No. 12, June 15, 1941-----	754, 773, 779

EXPERIMENT STATION RECORD

VOL. 85

JULY 1941

No. 1

THE NATIONAL NUTRITION CONFERENCE FOR DEFENSE AND ITS SIGNIFICANCE FOR THE EXPERIMENT STATIONS

Although the fundamental importance of nutrition in the national program of defense has been pointed out by scientific workers and others on numerous occasions, among them the 1940 convention of the Association of Land-Grant Colleges and Universities (E. S. R., 84, p. 3), it is a phase of defense effort which may easily be overshadowed by more spectacular developments. The National Nutrition Conference for Defense, which was called by President Franklin D. Roosevelt to meet in the National Capital from May 26 to 28, 1941, was therefore a timely gathering which helped to focus attention upon the situation and place it squarely before the public. An even larger and more lasting service was the opportunity for the detailed consideration of what needs to be done and how to do it. From both points of view it was of direct interest to the agricultural colleges and experiment stations.

The chairman of the conference was Hon. Paul V. McNutt, Administrator of the Federal Security Agency and Coordinator of Health, Welfare, and Related Defense Activities, and it was held under the direct sponsorship of the Coordinator's Nutrition Advisory Committee. This committee is headed by Dr. M. L. Wilson, Director of Extension Work, U. S. Department of Agriculture, with Dr. Helen S. Mitchell, formerly research professor of home economics in the Massachusetts Experiment Station and now Director of Nutrition in the Office of the Coordinator, as secretary, and 18 representatives from the Office of Education, Food and Drug Administration, Public Health Service, National Youth Administration, and Social Security Board, all of the Federal Security Agency; the Works Progress Administration; the U. S. D. A. Office of Agricultural Defense Relations, Surplus Marketing Administration, and Bureau of Home Economics; the Children's Bureau; the Office for Emergency Management; the American National Red Cross; the National Research Council; the Institute of Food Technologists; the American Institute of Nutrition; the American Dietetics Association; and the American Home Economics Association.

Interest in the conference proved greater than anticipated, the registration approximating 1,000, drawn from all sections of the Union. The land-grant institutions were represented by one or more participants from at least 41 States. Many of these representatives were home economics workers, but the presence of chemists, bacteriologists, sociologists, economists, dairymen, and others gave evidence of the broad appeal of the program.

That the conference was "vested with an official interest" was readily demonstrated. The general sessions were opened with a letter from President Roosevelt, in which he pointed out that the conference "has significant responsibilities—to explore and define our nutrition problems and to map recommendations for an immediate program of action." It closed with a reminder from Mrs. Roosevelt that its objectives were definitely among the "nonmilitary things which need to be done now." One of the major addresses was given by Vice President Henry A. Wallace on the topic Nutrition and National Defense. Secretary of Agriculture Claude R. Wickard, Secretary of Labor Frances Perkins, Assistant Secretary of State Adolf A. Berle, Jr., Coordinator McNutt, Surgeon General Thomas Parran, Deputy Director of the National Selective Service System Lewis B. Hershey, and Consumer Advisor Harriet Elliott of the Office for Emergency Management were among the representatives of Federal agencies with addresses before the six general sessions.

For its more detailed deliberations the conference was organized into nine sections. Two afternoons were available for the sectional programs, and in each case a report was presented with recommendations.

The immediate interest of experiment station workers was centered in Section 1, Research and National Nutrition Problems. This section met under the chairmanship of Dr. E. V. McCollum of Johns Hopkins University and according to its report "dealt with all the principal lines of inquiry in the nutrition field." Although it was recognized that, with few exceptions, "the fundamental knowledge which we possess concerning the number and nature of the chemical substances which constitute the essential nutrients, their distribution in our ordinary foods, and the pathological effects of their underprovision was derived from animal experiments," and "is still incomplete in all these fields of inquiry," it was believed to be "sufficiently extensive to be of outstanding value in making possible the formulation of adequate dietaries at several cost levels, for recognizing several specific types of malnutrition, for conserving nutrients in foods, and, in the case of several of the vitamins, the utilization of synthetic products to supplement deficient dietaries." It was agreed, however, that the need for further research is "urgent in

the following fields: (1) Improvement of presently known chemical and biological procedures for estimating the amounts of the essential nutrients in foods and their physiological availability; (2) more refined technics for the detection of nutritional deficiency states, especially in the subclinical degrees of intensity; (3) more precise determination of the optimum and minimum requirements of human subjects for each of the nutrients, as influenced by age and physiological status (including pregnancy and lactation) and those factors which affect their utilization; (4) study of problems relating to the nutritional needs of the individual as influenced by constitutional inefficiencies, by suboptimal nutrition, by disease and convalescence; (5) studies directed toward clear definition of the physical status of the individual; (6) study of all factors affecting the nutritive value of foods and their preservation during the interval between production and consumption; (7) study of methods of preparation of foods for consumption so as to avoid losses of nutrients; (8) food habits and methods and effects of changing them." The section also authorized the appointment of a committee "to survey existing facilities in all the universities, agricultural and land-grant colleges, or other laboratories of the country fitted to carry out substantial portions of the general research program outlined in the report as adopted, and include in this survey an estimation of additional funds which may be necessary to effect promptly and efficiently the execution of these researches."

Emphasis upon the need for research, however, was not confined to Section 1, but was evident in what may be termed the "action" sections. Specifically, in Section 2, Economic Policy and Social Responsibility as Related to Nutrition, an outline of a comprehensive action program was followed by a concluding recommendation as follows: "Action programs should include provision for research in order to provide the needed basic information. For example, education in food choice should be based upon knowledge of food preferences and prejudices; family food production should be promoted with knowledge of possible advantages to families; spot surveys should be made from time to time to supplement the basic data on food consumption and dietary levels provided by the consumer purchases study. To this end we recommend that an increase be made in Government appropriations for economic research bearing on nutrition in the Federal bureaus and in the experiment stations of land-grant colleges and that private research foundations give increased attention to research bearing on economic and psychological factors affecting food consumption. Such investigations should be directed to the improvement of nutrition status."

Likewise, Section 4, Nutrition for Workers in Defense Industries, declared that "greater and more precise knowledge concerning the

nutrition of defense workers is an urgent need. . . . Properly controlled studies provide the only convincing evidence of the benefits which result when the deficiencies of inadequate diets are suitably supplemented. It is therefore recommended that adequately controlled studies be conducted in selected defense plants to determine the facts concerning the influence of diet on health, working capacity, incidence of accidents, absenteeism, and the psychological state (industrial unrest). Workers and employers who cooperate with governmental or private scientific agencies in carrying out such studies will be performing a national service."

In Section 7, Nutrition Problems in Distribution and Processing of Foods, a number of urgent needs were mentioned, and it was recommended that "closer cooperation be developed between the food-processing industry and governmental research organizations and that fundamental research be adequately supported and encouraged by the Government. . . . The research, service, planning, and action programs of the Government in the field of agricultural marketing and food distribution should be greatly strengthened and expanded."

The conference as a whole expressed its belief that "poor diets and undernourishment are widespread in this country," and that "while these conditions offer no grounds for alarmist statements, they are serious enough to be a genuine cause of weakness in the present national emergency and to warrant national attention and concerted action." Prominent among the lines of attack which it urged as particularly important was "vigorous and continuous research to add to our present knowledge of the nutritional needs of individuals, the nutritional status of groups in the population, the nutritive content of everyday foods, and the effects of various methods of processing, storing, and cooking on their nutritive value."

Much stress was also laid on the need of a more extended educational program. Following suggestions from Section 3, Public Health and Medical Aspects of Nutrition, Section 5, Methods of Education in Nutrition, and Section 6, Professional Education in Nutrition, the conference advocated "more widespread education of doctors, social-service workers, teachers, and other professional workers in the newer knowledge of nutrition."

These recommendations indicate the increasing responsibilities which are being brought to the agricultural colleges and experiment stations as the defense program gets under way. The widespread participation of these institutions in the conference is evidence of their recognition of these responsibilities, and indicates that they will meet to the limits of their resources all demands which may reasonably be made upon them. It is fortunate that such a potential national asset is so fully mobilized at this time.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations at the California Station] (*California Sta. [Bien.] Rpt. 1939-40*, pp. 139-142, 143-144, 147-149).—Topics briefly reported upon are a lye process for peeling walnut meats, canned prune products, fruit and vegetable juices, sterilizing canned vegetables, olive products, sulfuring fruits for drying, new types of wine, vitamin content of wines, observations on yeast, and clouding of white wine.

[Chemical investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 57-58, 58-60, 69-70).—This report briefly notes work on chemical factors influencing the quality of wheat and flour, by E. B. Working; tempering factors affecting the quantity and quality of wheat flour, by J. E. Anderson; factors which influence the colloidal properties of dough, by C. O. Swanson; and the production of starch by the wet milling of sorghum grain, by H. N. Barham and J. W. Greene.

[Pectin investigations by the Delaware Station] (*Delaware Sta. Bul. 227 (1940)*, pp. 19-20, fig. 1).—This report notes work by G. L. Baker and M. W. Goodwin on factors that induce jellying, including removal of methoxyl groups attached to the galacturonic acid nucleus, which increases the jellying value; and on the pectin composition which will jelly without sugar and its utilization in freezing soft fruits.

Official and tentative methods of analysis of the Association of Official Agricultural Chemists, edited by E. M. BAILEY ET AL. (Washington, D. C.: Assoc. Off. Agr. Chem., 1940, 5. ed., [rev.], pp. XII+757, figs. 61; reviewed in *News Ed. (Amer. Chem. Soc.) 18 (1940)*, No. 24, p. 1160).—This is a revised edition (E. S. R., 76, p. 747) of this well-known handbook of accepted analytical procedures. The review, by F. L. Dunlap, compares the fifth with the fourth edition in regard to omissions of obsolete methods and inclusions of new material.

Determination of ammonia and amide nitrogen in connection with the chlorate method for nitrogen in plant tissues, E. M. ERMERT. (Ky. Expt. Sta.). (*Plant Physiol.*, 14 (1939), No. 2, pp. 341-349).—In the chlorate method the nitrogen of amides, ammonia, and some other compounds appears among the end products of the oxidation in the form of ammonium salts and is determined as ammonia by means of the Nessler solution. Nitrates, alkaloids, proteins, and amino acids yield their nitrogen content as nitric acid, which is determined by phenoldisulfonic acid. The nitrogen content of pyridine, not determinable by the Kjeldahl method, was converted partly to ammonium salts and partly to nitric acid. It was quantitatively recovered by determination of both nitrate nitrogen and ammonia nitrogen.

Application of the ceric sulphate method in the analysis of carbohydrates in the roots of *Lepidium* and *Convolvulus*, C. G. BARR. (Colo. Expt. Sta. and U. S. D. A.). (*Plant Physiol.*, 14 (1939), No. 2, pp. 285-296, figs. 4).—The author obtained cuprous oxide precipitates of abnormal appearance and

behavior in determining the total sugars in extracts of the roots of *L. draba repens*. Satisfactory results in the determination both of total sugars and of total carbohydrates in *Lepidium* roots were obtained by the use of the ceric sulfate method, and this method was more rapid and convenient than copper reduction methods. Sucrose could be determined in *Convolvulus* roots with equal accuracy by either method. Samples treated with vegetable carbon gave variable results in their method.

Rapid determination of soybean-oil content and of iodine number of soybean oil, L. ZELENY and M. H. NEUSTADT (*U. S. Dept. Agr., Tech. Bul.* 748 (1940), pp. 23, figs. 6).—Methods now in common use for determining oil content and iodine number being too time consuming for commercial inspection procedures, the rapid refractometric methods previously developed for the routine determination of both these factors in flaxseed have been adapted to the analysis of soybeans. These methods have been compared with the fundamental methods for determining oil content and iodine number and have been found to give reliable results in a much shorter time than that required by the conventional procedures.

Determination of iron in liquid food products, H. L. ROBERTS, C. L. BEARDSLEY, and L. V. TAYLOR, JR. (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 6, pp. 365-367, figs. 2).—This method, developed to permit rapid determinations of iron in small samples (10 gm) of fluid products, is based on the Stugart procedure (*E. S. R.*, 69, p. 493), which is a colorimetric method using potassium thiocyanate and the principle of dry ashing. It is outlined in detail as to preparation of the iron standard, procedure, and extraction of iron and colorimetric comparison. It differs from the Stugart procedure in that a small sample is employed, a wet-ash procedure (requiring special microdigestion equipment) is used, and the procedure for hydrochloric acid hydrolysis of pyrophosphates is eliminated.

Data presented indicate satisfactory recoveries of iron added before ashing to the various fresh or bottled food products. Zn, Cu, Al, Sn, Pb, Ca, and P were found to be without interference in tests in which these metals were added to pure iron solutions. The hydrochloric acid and wet-ashing hydrolysis procedures were shown to be equally effective as applied to ferric pyrophosphate. Average, maximum, and minimum values are reported for iron content as determined in samples of fresh citrus and tomato juices; bottled or canned pineapple, apple, grape, prune, and cherry juices and cider; and brewed coffee, whole milk, evaporated milk, beer, ale, and ginger ale.

Report on magnesium and manganese in fertilizers, J. B. SMITH and E. J. DESZYCK. (*R. I. Expt. Sta.*). (*Jour. Assoc. Off. Agr. Chem.*, 21 (1938), No. 2, pp. 277-293).—Various solvents, and several methods for determining the magnesium extracted by them, were compared experimentally. It is pointed out that any method purporting to indicate "active" or "available" magnesium oxide must be shown to correlate with actual plant response before dependence can be placed upon it as an index of true availability. A special ammonium citrate extracting solution consisting of 4 percent citric acid adjusted to pH 4 with ammonium hydroxide seemed promising.

Comparison of chemical methods for estimating the availability of magnesium, L. F. RADER, JR., K. V. ZAHN, and C. W. WHITTAKER. (*U. S. D. A.*). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 404-411).—A comparison of chemical methods for determining the availability of magnesium from various carriers indicated, in tests made with several solvents, that active magnesium oxide is completely available, although confirmation by actual plant tests is lacking. "A special citrate solution recommended by Smith [noted above] gave results for the availability of dolomitic magnesium

that more closely approximated the results of plant tests than did any of the other solvents tried."

Formation of trimethyleneglycol from glycerol by *Aerobacter*, M. N. MICKELSON and C. H. WERKMAN. (Iowa State Col.). (*Enzymologia*, 8 (1940), No. 4, pp. 252-256).—The fermentation of glycerol by four strains of *Aerobacter* in a medium of only glycerol and inorganic salts resulted in the conversion of about 45 percent of the glycerol to trimethylene glycol. Small amounts of acetylmethylcarbinol and considerable quantities of 2,3-butyleneglycol were also found but no succinic acid. It is pointed out that these results are in contradiction to the concept that only the intermediate coli-aerogenes bacteria form trimethylene glycol from glycerol, and that the formation of trimethylene glycol from glycerol by *Aerobacter* invalidates the use of glycerol in the differentiation of the intermediate coli-aerogenes forms from *Aerobacter*.

Chemistry and technology of the vitamins [trans. title], H. VOGEL (*Samml. Chem. u. Chem. Tech. Vorträge, n. ser., No. 45* (1940), pp. VIII+271, fig. 1).—This volume, intended as an introduction to the chemistry of the vitamins, gives particular consideration to vitamins A, D, E, K, thiamin (aneurin), riboflavin (lactoflavin), pyridoxin (adermin), and nicotinic acid. For these, such matters as occurrence, chemical constitution, chemical properties and reactions, physiological activity, synthesis, and technical preparation as pure or as concentrated products are discussed. Other vitamins less well-defined are considered briefly. The material presented is based upon a large number of studies from the literature which are cited in footnotes.

Assay of vitamin A with the photoelectric colorimeter, R. B. FRENCH. (Fla. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 12* (1940), No. 6, pp. 351-352, figs. 2).—Results obtained, using the Cenco photometer and the antimony trichloride reaction for vitamin A determinations on a reference cod-liver oil (3,000 International Units per gram), a shark-liver oil (20,000 I. U.), and a liver oil concentrate (55,000 I. U. per gram), are reported. In the procedure used a properly diluted aliquot of a sample of the oil in chloroform was placed in 1 cc. volume in the colorimeter cup and treated at once with 10 cc. of 30 percent antimony trichloride in chloroform. The readings were started immediately. The Cenco No. 4 filter was used with the instrument, which was calibrated to read percentage transmission of light directly. Curves based on readings taken at 30-sec. intervals showed that the blue color faded rapidly, but that the depth of color developed was proportional to the quantity of oil taken if the time interval used was constant. Using the interval of 30 sec. for measurement, color was developed in different quantities (as computed from the manufacturers' reports) of the concentrate, the shark-liver oil, and the standard cod-liver oil both before and after saponification. The data, plotted for comparison, indicated that Beer's law was followed by the color development in each sample. Saponification reduced the amount of material that formed color with the reagent, this reduction being greatest for the cod-liver oil and least for the concentrate. Thus this colorimetric procedure, although giving constant and reproducible results on the blue reaction, could be used with confidence only with evidence that various samples of the same kind of oil contained, either before or after saponification, approximately the same ratio of vitamin-active to vitamin-inactive chromogenic materials.

The constitution and physiological significance of carotene and allied pigments, R. A. MORTON (*Chem. and Indus., 59* (1940), No. 18, pp. 301-307).—This address considers the occurrence, chemical constitution, and certain physicochemical properties of carotene and other carotenoid pigments, and their relation to vitamin A; vitamin A in milk; vitamin A requirements; and the relative efficiency of carotene and vitamin A.

Carotene and allied substances in foods and feeding stuffs, I, II (*Analyst*, 65 (1940), No. 770, pp. 263-265, 266-278).—Part I is a condensed summary of the paper by Morton noted above. Part 2, The Commercial Determination of Carotene and Allied Pigments, with Especial Reference to Dried Grass and Other Leafy Materials, by W. M. Seaber, reviews briefly procedures reported by different workers for extraction of the pigments from the plant material; for separation of the various pigments in the extract, including chromatographic separation; and for determination of the carotene by colorimetric or photoelectric methods. The author's experiences with certain of these procedures are noted, and a method suitable for ordinary routine commercial evaluation of products is outlined in some detail. This method consists in extraction of a small (0.25-0.05 gm.) finely ground sample with a mixture of 15 cc. of acetone and 45 cc. of petroleum ether until the pigment is completely removed. The extract, transferred to a separatory funnel, is shaken with 5 cc. of a 30 percent solution of KOH in pure methyl alcohol, 200 cc. of water are added, and after two gentle inversions of the separatory funnel the aqueous layer is run off and the petroleum ether layer is washed once with 200 cc. of water. Chlorophyll and flavones are thus removed. Xanthophylls are removed from the petroleum ether extract by shaking successively with 30, 15, and 15 cc. of methyl alcohol made by mixing 90 volumes of absolute methyl alcohol with 10 volumes of water measured separately. After separation of the layers, the petroleum ether solution is made up to 50 cc. or other convenient volume for color measurement. In the author's laboratory such measurement was usually made photoelectrically by means of the Spekker photoelectric absorptiometer. Results of a number of samples are presented. It is pointed out that this determination estimates crude carotene only and that chromatographic analysis, using Merck's alumina in the 3 percent acetone process, showed that true carotene sometimes amounted to only 80 percent of the figure obtained.

Carotene and allied pigments (*Nature* [London], 145 (1940), No. 3669, pp. 286-288).—Essentially noted in part 1 of the above paper.

Effect of certain carbohydrates on the determination of carotene, E. J. LEASE and J. H. MITCHELL. (S. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 6, pp. 337-338).—Attempts to determine carotene in cooked sweetpotatoes by methods involving initial extraction with alcoholic KOH gave very low results, although biological studies with rats indicated that these sweetpotatoes were potent sources of vitamin A whether raw or cooked. The difficulty in removing the carotene of the cooked sweetpotato seemed to be due to interfering substances formed during the cooking process. The various tests, described, for determining the nature and the action of these interfering substances indicated that they were resinous films formed, apparently, by polymerization of the carbohydrate by the alkali. These films held the carotene particles so tightly as to prevent extraction by cold or boiling 95 percent ethanol, ether, acetone, or petroleum ether. The resinous matter could be dissolved, however, by boiling the sweetpotato mass for 5 min. with 3 volumes of water. Some of the carotene of stored raw sweetpotatoes and certain other vegetables, notably carrots and summer squash, was also found resistant to extraction following treatment with alcoholic KOH. It is suggested, therefore, that in samples containing large amounts of carbohydrate the carotene be determined by extraction with ethanol; or if alcoholic KOH is used that the material be subsequently boiled with water to dissolve the resins before extraction of the carotene by fat solvents.

Determination of cocarboxylase and aneurin: A micro-modification of Ochoa and Peters' method, H. G. K. WESTENBRINK (*Enzymologia*, 8 (1940),

No. 2-3, pp. 97-107, figs. 4).—Based on the observation that the splitting off of carbon dioxide from pyruvic acid by alkaline washed yeast, supplied with magnesium chloride and cocarboxylase, is stimulated by free thiamin and that the stimulation by the thiamin reaches a maximum at certain concentrations, Ochoa and Peters (E. S. R., 82, p. 278) devised a method for the estimation of cocarboxylase (thiamin pyrophosphate) and free thiamin separately in which the amount of carbon dioxide produced in 30 min. was measured by the Warburg technic. In the present modification, outlined in detail, the carbon dioxide production is measured by the "Cartesian-diver" technic of Linderström-Lang. The sensitivity of the method permits the determination of as little as 0.0005 γ of cocarboxylase and 0.0005 γ of thiamin.

The preservation of ascorbic acid in drawn samples of blood, R. J. KASSAN and J. H. ROE (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 579-584, fig. 1).—Studies of the stability of ascorbic acid in blood are reported, with the conclusion that "maintenance of conditions which preserve the intactness of the red cells has been found the most effective procedure for stabilizing the ascorbic acid content of drawn samples of blood." For plasma ascorbic acid determinations, this means holding the whole blood undisturbed until the analysis can be made, at which time the sample of plasma is obtained by centrifuging. It is considered most important to preserve the intactness of the red cells. Pyrex, paraffin-, and collodion-lined tubes as containers gave better preservation of the ascorbic acid than ordinary glass containers, probably because of the tendency of the red cells to adhere to the sides of the latter containers.

Rapid method for determining ascorbic acid concentration, M. A. ELLIOTT, A. L. SKLAR, and S. F. ACREE (*Jour. Res. Natl. Bur. Standards [U. S.]*, 26 (1941), No. 2, pp. 117-128, figs. 5).—"In the course of investigations on the effect of citrus fruits upon the human organism it was found necessary to develop a method of determining the vitamin C content of the blood of a large number of individuals in a short time. In this method the plasma is not deproteinized but is diluted with 5 percent acetic acid and used directly in a specially constructed photoelectric comparator with the dye, 2,6-dichlorophenolindophenol. The ascorbic acid content of the plasma sample is read directly from empirical calibration curves determined by adding known amounts of ascorbic acid to blood plasma. The comparator is operated so as to compensate automatically for the usual variation in the turbidity and color of plasma samples. While the method is quite rapid, once it is in operation, some time must be spent in preparing calibration curves. The maximum total error in the determination on plasma samples containing from 0 to 3.5 mg. of reduced ascorbic acid per 100 cc. of plasma was estimated to be ± 0.1 mg./100 cc."

It is noted that in about 5 percent of the blood samples analyses by the method described are complicated by exceptional turbidity. In a study involving large numbers of analyses such samples may be discarded. Otherwise it is necessary to prepare special calibration curves or make use of one of the longer chemical precipitation and extraction methods if an accurate determination is essential. The application of the method to the analysis of urine is described briefly.

Studies on ascorbic acid oxidase, G. B. RAMASARMA, N. C. DATTA, and N. S. DOCTOR (*Enzymologia*, 8 (1940), No. 2-3, pp. 108-112, fig. 1).—The present studies were undertaken to throw light on the nature of ascorbic acid oxidase, the enzyme capable of aerobically oxidizing ascorbic acid to its reversible oxidation product. The oxidase preparations used were prepared by methods noted from the press juices of cucumbers (*Cucumis sativus*) and of drumsticks (*Moringa pterygosperma*). In testing the activity of the enzyme preparations the unit of activity was taken as the amount of ascorbic acid oxidase which would

oxidize 50 percent of 0.5 mg. of ascorbic acid at room temperature (22.5°–23.5° C.) in 5 min. with $M/15$ phosphate buffer of pH 5.3 in a total volume of 5 cc. A quantitative study of the copper content of the enzyme preparations in relation to their activity showed a definite and steady increase in the copper content of the preparations with increasing activity per gram of material (dry basis). This straight line relationship between activities and copper contents led to the conclusion that copper is an active constituent of ascorbic acid oxidase. The influence of proteins on the catalytic activity of added copper was studied, under the same experimental conditions as those for the enzyme activity determinations, by observing the rate of oxidation of ascorbic acid, catalyzed by added copper, under the influence of a globulin extract prepared from Bengal gram flour. The results, presented in tabular form, indicated that the copper-protein mixtures resembled the ascorbic acid oxidase in some respects but that their activity was less than that of the enzyme per unit weight of copper. It is concluded, therefore, that the high catalytic activity of the copper in the enzyme is associated with the existence of a specific group, possibly a protein, as a constituent of the ascorbic acid oxidase.

A stable thromboplastin for use in Quick's prothrombin test, A. W. SOUTER, R. KARK, and F. H. L. TAYLOR (*Science*, 91 (1940), No. 2370, p. 532).—A preliminary note.

Quick's prothrombin test simplified by the use of a stable thromboplastin, A. W. SOUTER and R. KARK (*Amer. Jour. Med. Sci.*, 200 (1940), No. 5, pp. 603–607, fig. 1).—The present paper, elaborating on the preliminary report noted above, gives further details as to preparation of the stable thromboplastin and its application, and presents assay results. This stable thromboplastin, for use in place of the fresh unstable thromboplastic extract employed in the prothrombin test originally described by Quick et al.,¹ is ready for immediate use, thus permitting the test to be performed with greater ease than formerly. The preparation of the stable product involves the extraction with 0.85 percent sodium chloride solution of the dried paste prepared from finely comminuted fresh rabbit brain stripped of superficial blood vessels. The saline extract is incubated at 56° C. for 15 min., then introduced in 1-cc. amounts into suitable vials, and dried by the lyophile method of Florsdorf and Mudd.² The dry material thus prepared is ready for immediate use upon dilution to the original volume. The activity of the lyophilized thromboplastin is not lessened by storage at room temperature for as long as 10 weeks. This is evident from the reported results of tests for activity of the product stored for periods of 1, 2, 3, 4, and 10 weeks.

Curves presented to show the prothrombin times of a series of dilutions of normal plasma (with prothrombin-free plasma) containing from 10 to 100 percent of prothrombin indicate that tests employing the saline extract of brain are more satisfactory than those using the more potent acetone extract of brain. The latter has such strong clotting power that definite reduction in prothrombin time is not observed until dangerously low prothrombin levels are reached. Accordingly, the saline extract of rabbit brain is the material of choice for lyophilization.

Sauce preparation from Pacific Northwest apples, A. M. NEUBERT and H. H. MORTEN. (*Wash. Expt. Sta. and U. S. D. A.*). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 3, pp. 68–71, 89, 92).—Procedures are outlined for three general methods developed for the preparation of sauce from apple varieties grown in the Pacific Northwest. "The method designed to yield a

¹ *Amer. Jour. Med. Sci.*, 190 (1935), No. 4, pp. 501–511.

² *Jour. Immunol.*, 29 (1935), No. 5, pp. 389–425, figs. 11.

U. S. Grade A (Fancy) canned applesauce consisted in following, as closely as laboratory equipment permitted, the method of manufacture as practiced in commercial plants. In addition, methods of preparing sauce using whole sliced fruit without peeling or coring and methods of preparing a lumpy or 'home style' sauce were studied." Special precautions found necessary to obtain a sauce meeting the quality standards for a Grade A product are discussed with respect to several quality factors (color, consistency, finish, absence of defects, and flavor).

Composition of American gum turpentine exclusive of the pines, T. C. CHADWICK and S. PALKIN (*U. S. Dept. Agr. Tech. Bul. 749 (1941), pp. 16, figs. 3*).—Gum turpentine derived from longleaf pine (*Pinus palustris*) was fractionally distilled, and the materials distilling below α -pinene and above β -pinene were separated. The samples used were the first and last portions of commercial distillations of gum. They were found to contain 0.07 percent of forerun and 7.7 percent of tailings.

The chemical and physical data of the final series of fractions, when correlated and considered in the order of ascending distillation temperatures, showed the constituents in the tailings to be approximately as follows: (1) A small quantity of an unsaturated hydrocarbon having properties similar to *p*-menthene, (2) considerable dipentene (about one-fourth), which appeared to contain a little δ -limonene, (3) a small quantity of terpinolene, (4) a considerable proportion (about one-third) consisting essentially of a mixture (approximately equal quantities) of methyl chavicol and alcohols, (5) a portion (about one-sixth) that was essentially bornyl acetate but also contained alcohols and a small quantity of alkyl ether, and (6) hydroxy compounds that were in part phenolic, another alkyl ether, and esters other than bornyl acetate. The alcohols appeared to be a complex mixture. Fenchyl alcohol could not be detected. A solid having the properties of pinocarveol hydrate was isolated, and also an alcohol that was solid at low temperature and had properties similar to pinocarveol.

In commercial turpentine-still operation, "the increase in β -pinene over α -pinene and the increase in tailings constituents were decidedly accelerated in the fractions obtained by prolonged distillation. Such constituents as dipentene, alcohols, and methyl chavicol (easily isomerized to anethole) increased to such an extent that, for example, the oil collected during a 45-min. period of prolonged distillation had a concentration of dipentene about seven times as great as that in the turpentine examined (sample B) and a concentration of methyl chavicol about four times as great."

A description of fractionating assemblies adapted to vacuum fractionation is given.

AGRICULTURAL METEOROLOGY

Reports on critical studies of methods of long-range weather forecasting, C. F. SABLE ET AL. (*U. S. Mo. Weather Rev. Sup. 39 (1940). pp. IV+130, figs. 72*).—In addition to an introduction, by L. F. Page, this number contains the following articles: Report on the Work of G. T. Walker (pp. 1-22), Verification of Three of Walker's Seasonal Forecasting Formulae for India Monsoon Rain (pp. 23-24); Report on the Work of S. K. Savur of India (pp. 25-26), Discussion of Some Theories on Temperature Variations in the North Atlantic Ocean and in the Atmosphere (pp. 52-57), and Summary of the Methods Used at the Scripps Institution of Oceanography (pp. 58-62), all by R. B. Montgomery; Polar Ice as a Factor in Seasonal Weather (pp. 27-51), Baur's Contribution to Long-Range Weather Forecasting (pp. 63-87), and A Prelimi-

nary Summary of the Multanovski School of Long-Range Weather Forecasting (pp. 92-96), all by I. I. Schell; Introduction to Reports on Variations of the Solar Constant as a Factor in Long-Range Weather Forecasting (p. 97), Comparison of Contemporaneous Measurements of the Solar-Constant (pp. 118-120), and Some Statistical Tests of Solar Constant-Weather Relationships (pp. 121-125), all by L. F. Page; Verification of Baur's Ten-Day Forecasts, by L. F. Page and P. F. Clapp (pp. 88-91); Accuracy of Smithsonian Institution Solar Constant Measurements, by H. G. MacPherson (pp. 98-117); and Review of H. H. Clayton on Long-Range Weather Changes and Methods of Forecasting, by H. C. Willett (pp. 126-130).

Remote automatic weather observations, H. DIAMOND and W. S. HINMAN, JR. (*Amer. Met. Soc. Bul.*, 21 (1940), No. 9, pp. 343-349, figs. 4).—This paper offers a brief description of the equipment (E. S. R., 84, p. 152) and analysis of the preliminary results obtained by its use.

The variation of the sun and weather, C. G. ABBOT (*Amer. Met. Soc. Bul.*, 21 (1940), No. 10, pp. 407-416, figs. 12).—A review of the author's studies of the subject.

The effects of tropospheric and stratospheric advection on pressure and temperature variations, C. M. PENNER (*Canad. Jour. Res.*, 19 (1941), No. 1, Sect. A, pp. 1-20, figs. 13).—Pressure and temperature variations at Sault Ste. Marie (1938-39) for all levels up to 20 km. were studied. The pressure extremes were progressively retarded at higher levels in the troposphere, whereas in the stratosphere the retardation decreased so that the phase became more nearly that of surface pressure. Temperature extremes at greater altitudes in the troposphere are advanced with respect to the surface values. In the stratosphere the temperature variation reversed phase. Pressure and temperature anomalies are discussed in relation to advection. High surface pressures were accompanied by a warm troposphere and a cold stratosphere, whereas the opposite was true of low surface pressures. Seasonal differences in pressure and temperature variations are discussed.

Winds in the upper troposphere and lower stratosphere over the United States, L. A. STEVENS (*U. S. Mo. Weather Rev. Sup.* 36 (1937), pp. [1]-29, pls. 28).

An important cause of general precipitation, H. L. CHOATE (*Amer. Met. Soc. Bul.*, 21 (1940), No. 9, pp. 369-377, figs. 8).—From a day-to-day study of the upper-air records, it is believed possible to explain widespread precipitation as a result of convective cooling of air strata through upwelling of currents of relatively small cross section, and that there is no fundamental difference in the process which produces local showers from that which produces widespread precipitation associated with the so-called frontal activity. By seven specific examples the author here attempts to show that this process has a greater application in producing general precipitation than has been previously suspected.

Is it possible effectively to control spring frosts? [trans. title], R. MONTANDON (*Rev. Étude Calamités*, 3 (1940), No. 10-11, pp. 131-148).—A review (57 references) and general discussion.

The forester's dependence on the science of meteorology, E. I. KOROK. (U. S. D. A.). (*Amer. Met. Soc. Bul.*, 21 (1940), Nos. 9, pp. 383-384; 10, pp. 397-406).—An address presenting a general discussion of the subject (59 references).

The Köppen classification of climates in North America, E. A. ACKERMAN (*Geog. Rev.*, 31 (1941), No. 1, pp. 105-111, figs. 3).—This is a critique of the Köppen classification of North American climates (E. S. R., 80, p. 447), with presentation of a new map of that continent in which an attempt has been

made to have the Köppen divisions correspond more closely to differences in the American landscape by embodying new data and using suggested revisions of the criteria of classification. Applications of the revised criteria to Europe and China are made.

Climatic regions of Korea and their economy, S. McCUNE. (Ohio State Univ.). (*Geog. Rev.*, 31 (1941), No. 1, pp. 95-99, fig. 1).

Summary of aerological observations obtained by means of kites, airplanes, and sounding balloons in the United States, C. M. LENNAHAN (*U. S. Mo. Weather Rev. Sup.* 38 (1938), pp. II+65, figs. 39).

Data from aerological soundings at Fairbanks, Alaska, during the winters 1936-37 and 1937-38 (*U. S. Mo. Weather Rev. Sup.* 40 (1940), pp. III+35).

Meteorological report for 1939, F. E. HEPNER (*Wyoming Sta. Rept.* 1940, pp. 50-53).—This is a brief report on precipitation, temperature, and killing frosts for the year and tabulated summaries (by months) of air pressure, temperature, precipitation, and wind.

Meteorological results of the Byrd Antarctic Expeditions 1928-30, 1933-35: Tables, G. GRIMMINGER and W. C. HAINES (*U. S. Mo. Weather Rev. Sup.* 41 (1939), pp. IV+377, pls. 5, figs. 2).

SOILS—FERTILIZERS

[Soil investigations by the California Station] (*California Sta. [Bien.] Rpt.* 1939-40, pp. 7-16, 94-97).—The use of special soil surveys of forest and range land (coop. U. S. D. A.), mapping of land use after the detailed soil survey, and work on the classification of soil types into natural land divisions, and a key for the identification of soils, as well as information on the productive capacity of different soil types, salinity of soils and waters and effect of saline waters on soil, and winter covers and cover-crop fertilization are considered. Research on recent developments in connection with determining the fixation of elements in the soil is reported. Pot experiments for determining fertilizer requirements and the effect of fertilizers are reported briefly. Recent research on the need of plants for molybdenum and the use of radioactive elements to study the method by which plant roots absorb nutrients from the soil are summarized.

[Soil investigations by the Delaware Station] (*Delaware Sta. Bul.* 227 (1940), pp. 14, 20-21).—Brief notes are given of work on the retention of fertilizers by the soil against leaching by H. C. Harris, and of investigations on the availability of calcium and potassium metaphosphates by G. M. Gilligan.

[Soil investigations by the Kansas Station] (*Kansas Sta. Bien. Rept.* 1939-40, pp. 32-36).—Brief reports of progress by W. H. Metzger on studies of phosphorus fixation in soils, effects of rotations and fertilizers upon crop yields and soil composition, and factors influencing soil aggregation; by P. L. Gainey on the influence of reaction of the soil solution upon the growth and activity of *Azotobacter*; by H. E. Myers on field and laboratory work on the influence of legumes and nitrogen-fixing organisms on the growth of plants and on the nitrogen balance; by J. C. Hide (coop. U. S. D. A.) on the storage, utilization, and evaporation of soil moisture; and by A. T. Perkins on soil-solution investigations as governed by H-ion concentration and other factors and a study of replaceable cations and anions in some Kansas soils.

[Soil investigations by the South Carolina Station] (*South Carolina Sta. Rpt.* 1940, pp. 37-39, 74-75, 146-151, figs. 2).—The topics studied were effect on run-off and erosion of organic matter incorporated with the soil and applied on the surface as a mulch, and run-off and erosion from different soil types, both by

T. C. Peele; factors influencing the iodine content of soils and rocks, by J. H. Mitchell and D. B. Roderick; and results of lysimeter experiments on the effect of different green-manure and cover crops on the rate of leaching, loss of plant food, and residual fertility of Norfolk coarse sand, by E. M. Roller and N. McKaig, Jr.

Landform types: A method of quantitative and graphic analysis and classification, L. A. WOLFANGER (*Michigan Sta. Tech. Bul.* 175 (1941), pp. 24, figs. 5).—The author points out the inexactness of the general terms in common use for the description of surface features and the wide latitude of interpretation of individual terms. He then proceeds to the presentation of a carefully elaborated system of land-form nomenclature and measurement, the data being obtained from series of traverses run across the region to be described. These data are used for the construction of a mean land-form graph, the calculation of a relief index, basal index and steepness index, etc.

Rock weathering and soil profile development in the Hawaiian Islands, G. J. HOUGH, P. L. GILE, and Z. C. FOSTER (*U. S. Dept. Agr., Tech. Bul.* 752 (1941), pp. 44).—Chemical analyses of 21 soil profiles show the effects of weathering on Hawaiian soil material derived from exceedingly young, young, and old volcanic ejecta exposed to rainfalls ranging from 18 to 273 in. The chemical nature of the soil is compared to the nature of the parent materials. Alumina is indicated as being least soluble in soils not highly weathered, whereas in highly weathered soils iron appears to be less soluble than alumina. The combined bases seem to be lost more rapidly than silica. The nature of the colloidal material found under the various stages of weathering is considered. A relation between combined water and alumina and decreasing percentages of organic matter and of combined monovalent and divalent bases downward was a general condition with practically all the profiles studied. Two distinct types of soil profiles were observed and tentatively called uniform and podzolic. These profiles are described in detail.

The water of constitution of certain typical soils of the Central Provinces, and its bearing on the parent rock material from which the soils are formed, R. H. and K. G. JOSHI (*Nagpur Univ. Jour.*, No. 5, (1939), pp. 89-93).—The highest water of constitution, from 5 to 6 percent, was found in soils derived from trap rock, while the lowest, about 1 percent, was found in soils derived from sandstone. The results indicate a possibility of determining the parent material of various soils on the basis of their water of constitution.

Relative productivity of the A horizon of Cecil sandy loam and the B and C horizons exposed by erosion, E. E. LATHAM. (*U. S. D. A. and S. C. Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, pp. 950-954, fig. 1).—The relative productivity of different horizons of Cecil sandy loam from experimental areas near Moore, S. C., is reported. The same rate of fertilizer but different analysis was used during the 4 yr. of the study, but the major difference in treatment was in 1939 when two plats of each horizon received manure at the rate of 4 tons per acre. The A horizon was more than 3 times as productive as the B and 11 times as productive as the C. Organic-matter additions in the form of stable manure resulted in increased yields on all horizons. The manure was relatively more effective on C horizon than on any of the other horizons. It is indicated that the additions of organic matter and an adequate supply of plant nutrients will greatly improve the productivity of eroded Cecil soils.

Why is subsoil unproductive? R. GARDNER (*Colorado Sta. Bul.* 464 (1941), pp. 7, figs. 6).—Laboratory and greenhouse investigations indicate that a lack of available phosphorus and nitrogen in the subsoils accounts for a large part of the decrease in crop yields following loss of the surface soils. The author

suggests that an application of from 100 to 200 lb. of treble superphosphate with 20 tons of manure per acre should give good results on most eroded or scraped irrigated land. If this amount of manure is not available, from 100 to 600 lb. of sulfate of ammonia, depending on the amount of manure applied, should increase crop yields.

The determination of the size distribution of soil clods and crumbs, E. W. RUSSELL and R. V. TAMHANE (*Jour. Agr. Sci. [England]*, 30 (1940), No. 2, pp. 210-234).—In a comparison of different methods for determining soil aggregation, the sieving technic, elutriator technic, hydrometer technic, and Cole-Edlefsen method of sampling (*E. S. R.*, 74, p. 598), condition of sample, and pretreatment of sample in relation to the results obtained by the different methods are discussed. Dispersion and exchange capacity are considered in relation to the separation of soil crumbs from the unaggregated sand grains in the crumb fractions. It is concluded that there appears to be no best method for determining the size distribution of water-stable aggregates in the soil. Several factors must be considered, and the method selected will depend upon the information desired.

Gas and vapour movements in the soil.—I. The diffusion of vapours through porous solids, H. L. PENMAN (*Jour. Agr. Sci. [England]*, 30 (1940), No. 3, pp. 437-462, figs. 5).—The factors affecting the movements of gas and vapor in the soil atmosphere were investigated. The technic followed and apparatus used for investigating diffusion are described in detail. The reaching of pressure equilibrium in soils was found to be retarded by adsorption.

The migration of iron and manganese in colloidal systems, E. WINTERS (*Illinois Sta. Bul.* 472 (1940), pp. 101-148, figs. 5).—A colloidal gel system prepared from bentonite, agar, gelatin, and silica was used to investigate the transport and redeposition of iron and manganese under various conditions. The complex nature of the soil system makes it desirable to start with a simple colloidal system to obtain information on the movement of the products of weathering in soils. It is the movement of the products of weathering which leads to soil-profile development, and a knowledge of the mechanism should be helpful in a study of soil genesis. The movement of iron and manganese was followed by placing upon the prepared gels colloidal sols of $\text{Fe}(\text{OH})_3$, MnO_2 , humus, Putnam clay, and gold, and studies were made of their stability and diffusion.

Considering the soil as a three-phase system in which convection as well as diffusion of molecules may occur is very helpful in relating these studies to soil processes. It was concluded from the stability and diffusion of the sols studied that diffusion of iron and manganese oxides in the sol form in soils must be of minor importance. Inorganic ferrous and ferric salts diffused in the gels with diffusion more rapid at lower pH. An hypothesis considering surface diffusion of ferrous ions is given to account for the formation of concretions in soils containing excess CaCO_3 .

Calcium transfer from mineral to plant through colloidal clay, E. R. GRAHAM. (Mo. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 1, pp. 65-71, pl. 1).—The transfer of a nutrient cation from the crystal of a primary mineral to the plant tissue by means of colloidal exchange is reported, using a pure sample of anorthite, specially treated, and colloidal clay extracted from Putnam silt loam. The amount of calcium transferred was determined by chemical analysis and by the growing of soybeans in various colloidal mixtures. With calcium in the crystal form as anorthite, plants took up 42.6 mg., while plants grown on a substrate in which the calcium from the anorthite had been transferred to the exchangeable form by colloidal clay took up 112.4 mg. of calcium. It would

seem, therefore, that colloidal clay becomes an effective agent in transforming slowly available plant nutrients to readily available nutrients.

Effect of fire-heating on the properties of black cotton soil in comparison with those of gray and of humus-treated soils. A. SREENIVASAN and R. K. AURANGABADKAR (*Soil Sci.*, 50 (1940), No. 6, pp. 449-462).—The heavy soils, such as the black cotton soil of Malwa, forming a greater part of the western section of Central India, very easily lose their tilth on wetting. Under these conditions, germination is poor, growth is stunted, and the yield is reduced. In a study of how to overcome this condition, it was observed that soils that were lightly fired were much improved for crop growth. Applications of fired soil produced a residual effect lasting 2 yr. The authors report investigations on the effect of fire heating on soil properties, such as moisture; hygroscopic moisture and moisture at sticky point; density, pore space, specific gravity, and swelling capacity; conductivity; pH; mechanical analysis; loss on ignition; carbon, nitrogen, and carbon:nitrogen ratio; available potash and phosphoric acid; and total exchange capacity. The method of fire heating is described in detail.

The changes brought about by fire heating are compared with those resulting from the application of humic manures to the soil and with the differences between black and gray soils. This was done because it was found that effects similar to burning are obtained by additions of gray soil occurring in low-lying areas adjoining black cotton tracts and by heavy application of humic manures throughout the profile of the black cotton soil. Fire heating resulted in improvement of the physical texture and degree of aggregation of the soil colloids, and is also followed by a slight decrease in exchange capacity and in replaceable calcium and magnesium, an increase in replaceable sodium and potassium and in total soluble salts, and a loss in organic matter. The addition of humic manure improves the physical properties, but the beneficial effect of the manure is due also in part to organic plant-food supply.

The pH of soils at low moisture content. A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 1, pp. 17-39).—Plants do not usually grow at the high moisture dilutions commonly used when making a pH determination. The investigations reported were directed to obtain a measure of pH at moisture percentages comparable to those found under field conditions. A large number of orchard soils from southern California were investigated. A shielded glass electrode and a calomel electrode were used for these studies, and various methods were tested in dealing with the contact of the electrodes with the soil. The glass electrode was found to be satisfactory for studying pH at low as well as at high moisture percentages. The moisture percentages were found to affect very markedly the pH value of soils. In general, for the orchard soils studied moisture decreases led to a more acid soil condition. Aeration, availability of soil nutrients or deficiency diseases, root disease, salinity, and many other factors that affect the health of orchard trees may be directly or indirectly related to the pH of the soil.

Losses of nitrogen and organic matter from dry-farm soils. A. F. BRACKEN and J. E. GREAVES. (Utah Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 1, pp. 1-15).—Because of the original low supply of nitrogen, together with the depleting characteristics of the alternate wheat and fallow system, soil nitrogen rather than moisture may be the limiting factor of crop production in certain dry-farm areas. Changes in nitrogen and organic matter which have taken place in dry-farmed lands of the Cache and Junab Valleys of Utah compared with virgin lands, as well as a study of the factors responsible for the changes, are reported.

In the Cache Valley virgin land in the first foot was found to be 15.9 percent higher in nitrogen and 20.4 percent higher in organic matter than adjacent wheat-

land. The second- to third-foot section was 14.8 percent higher in nitrogen on virgin land than on cropped land. The same comparison for the Juab Valley showed a nitrogen loss of 14.5 percent in the first foot and 10.6 percent in the second to third foot, while organic-matter loss in the surface foot amounted to 18.8 percent. Loss of nitrogen and organic matter on severely eroded areas in the Cache Valley amounted to 58.5 and 57.8 percent, respectively, as compared to level uneroded land in crops. The equilibrium level for nitrogen for the Juab Valley soils was considered to be near 0.09 percent and for the Cache Valley soil approximately 0.17 percent. In accounting for the nitrogen lost from cultivated dry-farm soil through means other than harvested crops, it was concluded that the major part of the loss had taken place in some way not well understood, perhaps as a result of chemical and biological changes resulting in volatilization of nitrogen in some form and with minor losses occurring through leaching and erosion.

Soil and water conservation in the southern Great Plains, H. H. BENNETT. (U. S. D. A.). (*Soil Sci.*, 50 (1940), No. 6, pp. 435-448).—In spite of the extent and intensity of the dust storms on the Great Plains from 1933 to 1936, the outlook at present, because of increasing use of water-conserving measures, is deemed better than for years. Thousands of acres of severe blow land have been protected under permanent grass cover, and hundreds of farms have been fully treated for soil and water conservation. The work indicates that soil erosion can be controlled if farmers have the will, the ingenuity, the energy, and the necessary knowledge to carry out the job.

The conservation and utilization of rainfall is a major factor for successful agriculture in the Great Plains. Much knowledge has been gained on this factor during the past few years. Contour tillage, level terraces, strip cropping, and basin listing have helped to hold rainfall on the land. Cover crops and crop residues have served to keep the ground surface open, absorptive, and resistant to erosion. Progress has been made in overcoming some of the difficulties in establishing vegetative cover. Contour furrowing prior to planting and new methods of harvesting grass seed have been helpful. For this area farmers must have a flexible farming system based on the relationship between crop yields and moisture in the soil at seeding time.

In addition to holding the rainfall on the land, there is the problem of preventing the serious moisture losses that take place through erosion. Work by the Nebraska Experiment Station and the U. S. D. A. Soil Conservation Service indicates that the utilization of crop residues disked in and on the surface of the soil is a very effective way to increase the amount of moisture in the soil. An application of the method of utilization of crop residues in other areas of the country is discussed.

For conservation of soil and water it is important that the grazing of range lands be controlled. Windbreaks have proved valuable in checking evaporation and wind erosion. The stabilization of dunes has presented a major problem, but much has been accomplished toward a successful method of stabilization. The economic aspects of soil and water conservation in the Great Plains are considered. Soil conservation districts are discussed as promising means of attaining local, State, and national conservation objectives.

The author reviews the situation during the last World War which led to the destruction of much of the soils of the country, and points out that regardless of the outcome of the present situation we cannot afford to jeopardize our most basic resource.

Soil losses from cultivated strips in strip-cropped fields in the Ohio Valley region, R. W. GERDEL. (Coop. Ohio Expt. Sta.). (*U. S. Dept. Agr. Cir.* 588

(1940), pp. 24, figs. 3).—Results from field studies in 1936, 1937, and 1938 on the effect of degree of slope and divergence from the contour on soil losses with different soil types and under different degrees of previous erosion on strip-cropped fields are reported. Soil losses were determined by measuring the soil deposited in the meadow strips immediately below the cultivated strips. The method of determining soil losses, recording, and analysis of data are given in detail. Soils studied are included in the following groups according to their erosion potentialities: (1) Residual soils with light-textured or permeable subsoils, (2) residual soils with moderate- to heavy-textured or compact subsoils, (3) glacial soils with light-textured or permeable subsoils, and (4) glacial soils with moderate- to heavy-textured or compact subsoils.

Soil losses increased with increase in contour divergence, length of watershed above the strip, percentage of watershed above the strip under cultivation, and slope of the strip. Soil losses from strips of different widths and different degrees of previous erosion showed that variation in the width of strips under 84 ft. did not affect soil losses, and that the greatest soil losses were from those strips on which previous erosion had been greatest. The data for study of the relation between soil loss from cultivated strips and land use on the watershed above the strip and the soil management on the strip-cropped field show that more soil was removed from a strip if the watershed above it was clean-cultivated than if it was under a cover of vegetation, and that soil losses decreased with increase in the fertility level of a strip.

The author assumed that a certain soil loss under strip-cropped conditions was permissible, and with this permissible loss as a basis, critical values were established above which soil losses are excessive. The critical value for contour divergence on residual soils was found to be 5 percent. It is indicated that the limited data for glacial soils do not permit the setting up of a similar critical value. However, it is suggested that the critical value for contour divergence in glacial soils would also be 5 percent. Critical values are given for slope of strip and length of watershed above the strip, for the four soil groups, corresponding to maximum allowable soil loss of 5, 10, 24, and 40 tons per acre, with the assumed critical value for contour divergence of 5 percent. Good soil management practices combined with strip cropping were found to be very valuable in reducing soil losses.

Fluctuations in numbers of bacteria in soil. N. JAMES and M. L. SUTHERLAND (*Canad. Jour. Res.*, 18 (1940), No. 9, Sect. C, pp. 435-443, figs. 2).—Studies on the relation of moisture, temperature, and time to the numbers of bacteria in a fallow plat were reported over a 15-week period during the summer of 1939.

Survival of bacteria added to soil and the resultant modification of soil population. S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Soil Sci.*, 50 (1940), No. 6, pp. 421-427).—The influence of enrichment of Sassafras loam soil with *Aerobacter aerogenes*, *Escherichia coli*, and *Brucella abortus* was investigated. The last two named organisms are not indigenous to the soil. One thousand gm. of soil were placed in glazed porcelain pots, covered with glass plates, and fresh suspensions of the bacteria added at intervals of about 1 week. The coliform bacteria were added as follows: One suspension before the first count, five before the second count, and one before the third. Soil samples taken at various intervals from several of the pots were plated out on egg-albumen agar and the plates were incubated at 23° C. for 4 days. The coliform bacteria were found to disappear very rapidly from the soil, but the total soil population was increased as a result of the addition of the bacteria. It is suggested that the increase in numbers may be due to the multiplication of soil organisms of the antagonistic type. With sterile soil

the coliform bacteria were able to survive and multiply. Repeating the experiment with a purified active bactericidal substance isolated from a soil actinomycetes, called actinomycin, revealed that the substance inhibited the growth of a large number of Gram-positive and Gram-negative bacteria and actinomycetes, but not fungi. Of the several antagonists isolated from the soil, actinomycin was found to be the most active. The nature of the antagonists depended upon the bacteria added, the soil treatment, and the temperature of incubation of soil.

The nutritional requirements of soil bacteria: A basis for determining the bacterial equilibrium of soils, P. M. WEST and A. G. LOCHHEAD (*Soil Sci.*, 50 (1940), No. 6, pp. 409-420).—Generalized results based on a study of the individual nutritional response of over 3,000 isolates obtained from various soils in connection with work on the root rot disease of strawberry are given. As the result of a study with three synthetic media, all the organisms studied are classified into five major divisions, as follows: (1) Bacteria with simple requirements, (2) bacteria which require cysteine, (3) bacteria which require a mixture of amino acids, (4) bacteria which require growth factors, and (5) bacteria with undefined requirements. The importance of a balance between two general nutritional classes of soil bacteria is emphasized. If conditions favor an increase in the occurrence of one group, the incidence of the other group must correspondingly fall. The expression of microbiological equilibrium on a mathematical basis is developed. Plant growth and seasonal conditions were found to have an effect on soil bacterial equilibrium. The importance of a qualitative investigation of complex soil bacteria based on a knowledge of the substances controlling the multiplication of those organisms is brought out.

A new species of sulfur-oxidizing bacteria from a coprolite, C. B. LIPMAN and E. McLEES. (Univ. Calif.). (*Soil Sci.*, 50 (1940), No. 6, pp. 429-433, pl. 1).—In testing coprolites of the Triassic, growth of a variety of organisms of several forms was obtained in some of the media. Among these was an alkaline sulfur medium prepared after the Jacobsen formula. In this medium an organism was found with a definite power to produce sulfates from sulfur and from thiosulfate. A detailed study of the organism revealed it to be quite distinct from other sulfate-producing organisms, and it is, therefore, recognized as a new species. The organism is described in detail. Since it does not correspond to the characteristics of the known forms, it is regarded as a new species and given the name *Thiobacillus coproliticus*.

Occurrence of *Rhizobium meliloti* bacteriophage in soils, H. KATZNELSON and J. K. WILSON. (Cornell Univ.). (*Soil Sci.*, 51 (1941), No. 1, pp. 59-63).—The presence of bacteriophage was determined for soil samples collected from alfalfa fields in the Finger Lakes region of New York State. Phage was found in every alfalfa field tested and in 58 of 62 samples taken, but there was no apparent correlation between age of alfalfa stand, soil type or reaction, and phage incidence. It is concluded that *R. meliloti* bacteriophage is widely distributed in soils bearing alfalfa; in fact, it may be said to be present in all alfalfa fields. Under certain conditions the phage may become sufficiently concentrated and virulent to destroy most of the legume organisms in the soil and thus interfere with symbiosis, or its presence may be as normal a condition as the existence of the organisms themselves in the soil.

Preliminary experiments of the estimation of traces of heteroauxin in soils, A. F. PARKER-RHODES (*Jour. Agr. Sci. [England]*, 30 (1940), No. 4, pp. 654-671).—The value of growth-promoting substances in increasing yields and disease resistance and in promoting the growth of cuttings has been considered

in several experiments, but very little attention has been directed toward investigations to determine if these active substances are found in soil. The author reports a method whereby small quantities of indolylacetic acid can be detected. Applications of manure to the soil tended to increase the quantity of heteroauxin present. The effect of sterilization and subsequent treatment of the soil on the content of heteroauxin was investigated. An equilibrium value for the heteroauxin content was attained in these experiments in less than 24 hr., and thereafter remained constant as long as the conditions were maintained. The presence of hormone-producing and hormone-destroying factors, including micro-organisms in the soil, the balance between which determined the quantity of hormone present and which was attained in a short space of time, was suggested as bringing about this condition of equilibrium.

Soil and field-crop management for southeastern New York, A. F. GUSTAFSON ([*New York*] *Cornell Sta. Bul.* 746 (1940), pp. 31, figs. 16).—The area dealt with in this bulletin comprises Westchester, Putnam, Dutchess, Columbia, and Rensselaer Counties, and the southeastern part of Washington County on the east side of the Hudson River; and on the west side of the river, Rockland, nearly all of Orange, the southeastern part of Ulster, and the Hudson River bottom-land parts of Greene, Albany, and Saratoga Counties. The climate; general topography and drainage; the agriculture; the composition and characteristics of the soils of this area; their lime needs; and erosion in southeastern New York, including methods recommended for the control of such erosion as is found in this area; the production of farm manure; fertilizer experiments and recommendations: rotations and fertilizers for corn and forage crops; special management for gravelly soils; pastures; forests as a farm crop; and some other related topics are taken up in a manner similar to that of previous bulletins (E. S. R., 80, p. 311).

Among the data obtained are the nitrogen, phosphorus, potassium, magnesium, calcium, and sulfur contents of 8 representative soils and the position, topography, color of the soil and subsoil, drainage, reaction, and crop adaptations of the main or most important types of the soil series found in the area under discussion, together with the pH values and estimated liming needs for red clover growing on 40 of the more important soils.

Crop production in artificial culture solutions and in soils with special reference to factors influencing yields and absorption of inorganic nutrients, D. I. ARNON and D. R. HOAGLAND. (Univ. Calif.). (*Soil Sci.*, 50 (1940), No. 6, pp. 463-485, pl. 1, fig. 1).—Investigations are reported on the inherent productive capacities of a fertile soil compared with those of a favorable nutrient solution. Consideration is also given as to the limiting factors in crop production in a fertile soil and to what extent these may be controlled in artificial nutrient media. Comparisons are made of the water economy of plant products grown in the soil and in nutrient solution. Uniform conditions for soil, sand, and nutrient-solution cultures were obtained by greenhouse investigations. Tomato plants were used. Yield records and plant analyses are reported for plants grown under the different treatments. The inherent capacity for crop production of a highly productive soil and of sand and water-culture media was found to be of the same order of magnitude. It is suggested that aeration may limit crop production in some soils, even when the supply of water and nutrients is adequate. Heating the nutrient medium did not lead to definite increase in rate of crop growth or in yield of fruit. The use of the water-culture method for commercial purposes depends on economic considerations, not on fundamental differences between soil and water-culture media or between small- and large-scale water-culture methods.

Nutrient value of the phosphorus in defluorinated phosphate, calcium metaphosphate, and other phosphatic materials as determined by growth of plants in pot experiments, K. D. JACOB and W. H. ROSS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 7, pp. 539-560, figs. 2.*)—The nutrient value of calcined phosphate as affected by particle size of material is reported from pot experiments made with Sudan grass and German millet on Clarksville silt loam, Norfolk loamy fine sand, Miami soil, De Kalb silty clay loam, and a dark reddish-brown friable clay, ranging in pH from 5.2 to 7.1, and with tomatoes on a calcareous sandy loam of pH 9.5. Tests are also reported on superphosphate, monocalcium phosphate, dicalcium phosphate, high-grade basic slag, ground raw phosphate rock, and Non-Acid Phosphate especially prepared.

Finely ground unreacted calcined phosphate, fused phosphate rock, and calcium metaphosphate were approximately equal to superphosphate as sources of phosphorus for the growth of plants on acid and neutral soils. On alkaline soils the above materials, as well as other types of water-insoluble phosphates, were not as effective as the water-soluble forms.

The effectiveness of the phosphorus or unreacted calcined phosphate increased as the fineness of the particles was increased. Increasing beyond 80 mesh, however, was of very little value. Citrate and citric acid solubility of phosphate in calcined phosphate and Non-Acid Phosphate did not correspond to plant-growth results obtained on acid and neutral soils. With the exception of unreacted calcined phosphate and superphosphate, the solubility in 2 percent citric acid appeared to be a better indication of phosphorus availability for plant growth.

A comparison of various extracting solutions for measuring the availability of phosphorus in soils of known fertilizer treatment and crop performance, M. E. WEEKS and P. E. KARRAKER. (Ky. Expt. Sta.). (*Soil Sci., 51 (1941), No. 1, pp. 41-54, fig. 1.*)—Twenty-five different acid, base, and salt extraction solutions were used on soils from long-continued phosphorus-fertilized plots at the station to determine their usefulness in measuring soil phosphorus which is available to crop plants. No one extractant appears to be appreciably better than another, and the choice should be on the basis of convenience and experience. Correlating the results obtained from the various tests with plant growth has certain limitations, but there is a general relationship in this respect between soils that have not been fertilized and those that have received fertilizers over a considerable period. The results obtained from some of the extraction solutions would be helpful in making fertilizer recommendations. It is suggested that a different scale might be necessary in making recommendations for soils of different types.

Clay minerals and phosphate availability.—I, Adsorption of phosphate ions by clay minerals; II, The utilization of adsorbed phosphate by plants, H. F. MURPHY. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc., 20 (1940), pp. 79-81, 83-86, pl. 1.*)—Kaolin was found to contain practically no water-soluble phosphate, and plant studies further substantiated the evidence of low availability of phosphorus in the kaolin complex. Montmorillonite, on the other hand, contained considerable water-soluble phosphate, and the complex did not decrease the availability of applied phosphorus when tomato plants were used as the indicator. A possible mechanism for the fixation of phosphorus is discussed.

The Egner lactate method for phosphate determination, H. EGNER (*Amer. Fert., 94 (1941), No. 5, pp. 5-7, 22, 24, 26, figs. 3.*)—Various factors to be considered in developing a laboratory method that will give information on phosphate fertilizer requirements similar to information obtained from field

experiments are reviewed. The author outlines recommended solutions and suggested procedure for following his proposed method.

Fertilizer injury to germination prevented by calcium, W. A. ALBRECHT. (Univ. Mo.). (*Com. Fert.*, 62 (1941), No. 1, pp. 8-9).—The protective action of calcium in the reduction of germination injury resulting from fertilizers is reported. It is suggested that perhaps fertilizer use will be improved by the use of calcium either within fertilizer mixtures or in the soil in connection with fertilizer applications.

Influence of limestone and dolomite upon sulfate retention from annual additions of potassium sulfate, W. H. MACINTIRE, W. M. SHAW, and B. ROBINSON. (Tenn. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 1, pp. 73-84).—The extent to which a soil can retain sulfates against leaching will determine the period during which sulfur supplied through fertilizers will be of nutritive value to crops and will also affect the need for soil liming. It is indicated that the rainfall of humid regions effects substantially complete removal of ordinary additions of fertilizer sulfates from the soil within a year. Acid soils may retain small amounts of the sulfate additions, but supplemental incorporations of finely ground limestone and dolomite accelerate and enhance the outgo of sulfates to an extent that precludes a build-up of sulfur from the sulfate applications. Successive annual additions of potassium sulfate exert no direct influence upon the ultimate pH of the soil, and the directly beneficial effects attributable to nutrient sulfur supplied by the sulfate components of ordinary additions of fertilizers would not extend to crops grown after those fertilized.

A nutrient element slighted in agricultural research, F. J. ALWAY. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, pp. 913-921).—A historical review of the use of sulfur as a plant nutrient is presented. Consideration is given to the amount of sulfur obtained from rain and snow. The amount of sulfur in the air varies greatly. Through the use of lead peroxide candles exposed to the atmosphere it was possible to determine the amount of sulfur absorbed per acre. At University Farm, at the edge of St. Paul, where exposures were made from 300 to 500 yd. from a 210-ft. stack of the heating and power plant, absorption during the summer varied from 5 to 7 lb. a month and in the winter from 18 to 22 lb., with an annual total of about 120 lb. per acre. Three locations in northern Minnesota gave an annual absorption of from 3 to 5 lb., with no great difference between winter and summer months. The need for additional investigations on sulfur replenishment from the air was brought out.

[Fertilizer investigations by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1939-40*, pp. 36, 38).—Progress on the fertilizer requirements of muck soils and general changes in fertilizer usage in Michigan are reported.

Sources and available supplies of commercial fertilizers, C. H. KUNSMAN (*U. S. Dept. Agr., Misc. Pub. 400* (1940), pp. 20, figs. 6).—A brief historical review of the use and manufacture of fertilizers is presented. Statistics are given on the amount of fertilizer used in the United States from 1910 to 1939 and on the extent of foreign trade in fertilizers. Data on the various forms of nitrogen, phosphoric acid, and potash, with information as to the source and status of supply of each, are summarized.

Fertilizers for New Jersey, 1941 (*New Jersey Stat. Cir. 406* (1940), pp. [8]).—Fertilizer recommendations for fruit crops, field crops, vegetable crops, home gardens, lawns, shrubs, and shade trees are presented. The use of lime for obtaining the maximum benefit from fertilizers on strongly acid soils is recommended. Liming should also provide magnesium. The number of grades of fertilizer is reduced to nine, and the grower is requested to think in terms of

ratios as well as grades. The effectiveness of commercial fertilizers in relation to soil condition and type of plant is considered.

Cooperative field experiments with commercial fertilizer mixtures, L. C. WHEETING (*Washington Sta. Bul.* 392 (1940), pp. 48, figs. 5).—Results of cooperative fertilizer studies on several different soil types, mostly in western Washington, with various crops and different amounts and ratios of fertilizers and based on a 5-yr. study, are reported. The importance of careful thought in selecting a fertilizer because of variations in response of different crops to fertilizers on the same soil type and of the response of the same crop on different soils is emphasized. The proper ratio of plant nutrients is also extremely important, 1:2:1, 1:2:2, and 1:1:1 ratios being those most common which gave good results. Fertilizer applications supplying less than 20 lb. available nitrogen, 40 lb. available phosphoric acid, and 40 lb. available potash were not found effective in increasing the yield of crops on soils where these elements were deficient.

Low-priced crops, such as hay and small grains, did not show economical returns from the use of fertilizers, whereas with high-priced crops, such as sugar beets or potatoes, satisfactory returns were obtained. The main need on livestock farms is indicated as being phosphate fertilization. It is suggested that greater returns from fertilizers may be obtained from methods of placement other than the broadcast system used in these studies.

Inspection of commercial fertilizers for 1940, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 329 (1940), pp. [1]+11).—Analyses and other data are presented for 116 fertilizer samples according to the provisions of the New Hampshire fertilizer law.

AGRICULTURAL BOTANY

A Swahili-botanical-English dictionary of plant names, P. J. GREENWAY (*Dar es Salaam, Tanganyika Ter., E. Africa: Govt., 1940, 2. ed., rev., pp. 308, pls. 10*).—Part 1 is alphabetized by the Swahili language names and part 2 by Latin binomials and English language names.

Comparison of different methods of botanical experimentation [trans. title], J. S. PAPADAKIS (*Rev. Argentina Agron., 7 (1940), No. 4, pp. 297-362, pls. 1*).—This is a monograph on statistical methods, with 13 references.

Note on a simple porometer cup for class use, L. J. AUDUS (*New Phytol., 39 (1940), No. 4, p. 426, fig. 1*).

Contributions to the study of Cuban flora: Gymnospermae [trans. title], J. P. CARABIA (*U. S. Dept. Agr., Forest Serv., Caribbean Forester, 2 (1941), No. 2, pp. 83-99*).

A check-list of the spermatophytes of St. Bartholomew, I, II, J. MONACHINO (*U. S. Dept. Agr., Forest Serv., Caribbean Forester, 2 (1940), No. 1, pp. 24-47; 2 (1941), No. 2, pp. 49-66*).

The flora of Whatcom County, State of Washington: Vascular plants, W. C. MUENSCHER (*Ithaca, N. Y.: Author, 1941, pp. 139, figs. 10*).—Following discussions of the ecological regions, native species useful for ornamental planting, weeds, poisonous plants, and botanical explorations in the State is an annotated list of plants arranged by taxonomic groups.

New rusts from America and Africa, G. B. CUMMINS. (*Ind. Expt. Sta.*). (*Bul. Torrey Bot. Club, 68 (1941), No. 1, pp. 43-48, figs. 7*).—New species of *Puccinia*, *Uromyces*, *Ypsilospora*, *Uredo*, and *Aecidium* are described from various hosts.

A monographic study of the genus *Thyronectria*, E. V. SEELE, JR. (*Jour. Arnold Arboretum, 21 (1940), No. 4, pp. 429-460, pls. 5*).—This study includes

keys to the subgenera (*Gyostromella*, *Dendrodochiella*, and *Megalonectria*) and species, and much new taxonomy.

Further pollen studies of post pleistocene bogs in the Puget lowland of Washington, H. P. HANSEN. (Oreg. State Col.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 3, pp. 133-148, figs. 2).—"Postglacial forest succession in the Puget Sound basin evidenced by pollen studies of two post-Vashon bogs about 100 miles apart corroborated the evidence of previous analyses of other peat deposits in the same region [E. S. R., 83, p. 324]."

The detection, distribution, and mobility of certain elements in the tissues of plants growing under different conditions as determined by the spectrographic method, R. P. HIBBARD (*Michigan Sta. Tech. Bul.* 176 (1941), pp. 30, fig. 1).—The modern spectrographic technic for analysis, with the modifications worked out at this institution, is presented as a possibility for use with plant tissues. Ether, acetone, and water-soluble extractions were examined from a variety of tissues, and the ash was studied for K, Ca, Mg, P, Fe, and Mn. The ether extractions indicated all but K to be fixed in some organic complexes not easily extracted with water, and the presence of these elements in the residue added further confirmation of metallo-organic complexes. It is improbable that K occurs in more complex organic combinations than in certain organic acid salts. The general opinions as to the distribution of the various elements in plant tissues under "normal" conditions were confirmed. Their distribution under conditions such as a reduction in day length and growth in Ca- or K-deficient solutions are noted and discussed in detail, and certain generalizations may be made:

Mobility is a matter of relativity. Fe and Ca are not to be considered immobile, and immobility is not merely a matter of chemical precipitation or one of inhibition of permeability. Protoplasm controls metabolic processes, and ion-organic compounds are built up and later disaggregated, energy exchanges, respiration, and other vital processes being involved. Admitting that the older theories are inadequate and that the true explanation is more deep-seated augurs for ultimate success. Short days slow up the total salt absorption, whereas full light favors the absorption of Ca, Fe, and K, and P and Mg appear indifferent. Roots and basal stems are low in minerals, but the gradient increases upward. Ca-deficient plants are higher in total salts than controls, but K-deficient plants are lower. It is evident that the plant's activity regulates metabolic reactions and in some unknown way causes greater absorption with one element and less with another, and changes or modifies the distribution of the elements according to a definite plan still to be discovered. The functions of these elements can now be only surmised and the data add little in this direction, but through the use of the spectrographic technic a better approach to the subject is possible and readily appreciated. The place of greatest accumulation would not then offer the key to the roles that the elements serve.

Protein synthesis in mature and senescent leaves of barley, J. WALKLEY (*New Phytol.*, 39 (1940), No. 4, pp. 362-369, fig. 1).—Using the fourth leaf of barley at three ages after reaching maximum area, with all tillers and the main shoot above the ligule of this leaf removed and with extra nitrogen supplied to the roots, it was found that protein nitrogen was rapidly synthesized. This capacity was apparently retained as long as chlorophyll was present, but for unknown causes the rate of synthesis declined with age.

Additions to the literature of mycorrhizae, A. P. KELLEY (*Landenberg, Pa.: [Landenberg Lab.], 1941, Sup. 4, pp. 13*).—This supplements lists previously noted (E. S. R., 82, p. 166).

Mechanism of symbiotic nitrogen fixation, P. W. WILSON. (Univ. Wis.). (*Chron. Bot.*, 6 (1940), No. 5, pp. 104-105).—A brief discussion of recent conceptions of a possible enzyme system involved in rhizobium-legume relations (*E. S. R.*, 82, p. 459).

The biochemistry of symbiotic nitrogen fixation, P. W. WILSON (*Madison: Univ. Wis. Press*, 1940, pp. XIV+302, pls. [28], figs. 28).—This monograph is a sequel to one on the root nodule bacteria by Fred, Baldwin, and McCoy (*E. S. R.*, 68, p. 755). When the earlier volume appeared the chemistry of symbiotic nitrogen fixation was relatively unexplored. Since that time the author and his staff have made extensive studies, and it seemed desirable to bring together their reports with those of other workers and to analyze the problem in the light of the accumulated knowledge. The text takes up the nitrogen economy of man and nature, leguminous plants in agricultural history, the biochemistry of the bacteria, interaction of host and bacteria, fixation of nitrogen by bacteria and plant, the C:N relationship in symbiotic nitrogen fixation, excretion of nitrogenous compounds by legumes, the chemical mechanism of the fixation process, physical-chemical characteristics of the enzyme system, and some practical applications.

Isolation of the alkaloids, berberine and berbamine, from Mahonia swaseyi, G. A. GREATHOUSE and N. E. RIGLER. (U. S. D. A. and Tex. Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 563-564).

Some effects of carcinogens on yeasts, C. W. and B. S. DODGE and G. T. JOHNSON (*Ann. Missouri Bot. Gard.*, 28 (1941), No. 1, pp. 1-30, pls. 5, figs. 3).—Studies of dry weights produced under standard conditions and population studies with large inocula revealed but slight differences between cultures with methyl cholanthrene and controls. Population studies by various methods, using smaller inocula, indicated a much longer lag phase, a gentler slope in the first logarithmic phase, and higher and more sustained peaks in the decline phase in cultures with carcinogens used (1,2,5,6-dibenzanthracene, benzpyrene, and methyl cholanthrene). The evidence indicated that each culture behaved as liquid tissue of an individual, with physiological as well as morphological differentiation of cells and with the probable secretion of a hormone by relatively few cells which stimulated cell division. Carcinogens stimulated the division of senescent or injured cells not ordinarily susceptible to the action of the postulated hormone. Stock cultures had long cycles of physiological activity which could be only slightly modified by frequent transfer. Attempted separation of morphological types of cells by fractional centrifugation and the selective action of media was only partially successful, and these types were not correlated with physiological activity. Movements of translation similar to those in the Myxophyceae, and the presence of a gelified sheath holding the cells together in small colonies, were noted.

Histological responses of bean plants to tetrahydrofurfuryl butyrate, W. R. MULLISON. (Purdue Univ.). (*Bot. Gaz.*, 102 (1940), No. 2, pp. 373-381, figs. 7).—Of the striking differences between the reaction of bean to this butyrate and to the other substances thus far investigated, the most prominent was the complete absence of root primordia arising either as a part of the tumor or near it. The xylem, which with its derivatives formed the largest part of the callus, was the most active tissue, though the phloem was also involved. The callus was largely composed of parenchymatous cells, scattered among which were groups of extremely large cells and areas of meristematic activity. The cavity formed by disintegration of the central region of the pith tended to be filled with parenchymatous cells derived from both the pith and xylem. Cam-

bial activity was stimulated and produced a little more secondary xylem than in untreated stems. The endodermis exhibited a moderate amount of activity, with no differentiation of vascular tissue, but it responded to the stimulation farther down the stem from the surfaces of application than did any other tissue. Another striking difference was the localization of the response within 1-3 mm. of the site of application.

Plant biochemistry and physiology, R. NEWTON, N. H. GRACE, and W. R. JACK (*Canada Natl. Res. Council Rev. Actv.*, 1939, pp. 19-20).—A brief progress report on studies of plant growth substances and hormones.

The correlation curvature in *Avena sativa* [trans. title], A. BEYER (*Planta, Arch. Wiss. Bot.*, 31 (1940), No. 2, pp. 244-250, figs. 2).—In this study the author was unable to find a parallelism between the effects of gravity and a disturbance of correlation in young oats coleoptiles. This fact presents a difficulty relative to the Cholodny-Went growth-substance theory of tropisms which he believes can be surmounted only by auxiliary hypotheses.

The extraction of auxin from plant tissues, K. V. THIMANN and F. SKOOG (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 951-960, fig. 1).—In this study the author was unable to find a parallelism between the effects of gravity and a disturbance of correlation in young oats coleoptiles. This fact presents a difficulty relative to the Cholodny-Went growth-substance theory of tropisms which he believes can be surmounted only by auxiliary hypotheses.

The extraction of auxin from plant tissues, K. V. THIMANN and F. SKOOG (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 951-960, fig. 1).—In this study the author was unable to find a parallelism between the effects of gravity and a disturbance of correlation in young oats coleoptiles. This fact presents a difficulty relative to the Cholodny-Went growth-substance theory of tropisms which he believes can be surmounted only by auxiliary hypotheses.

Effect of indoleacetic acid on thin sections and detached segments of the second internode of the bean, J. M. BEAL (*Bot. Gaz.*, 102 (1940), No. 2, pp. 366-372, figs. 2).—The cellular changes and responses of these segments and sections were essentially similar to those taking place in intact treated second internodes.

Starch hydrolysis in bean leaves as affected by application of growth-regulating substances, J. W. MITCHELL and M. R. WHITEHEAD. (U. S. D. A.). (*Bot. Gaz.*, 102 (1940), No. 2, pp. 393-399, fig. 1).—"Lanolin emulsions containing various growth-regulating chemicals were sprayed on attached bean leaves, and the plants were subsequently placed in darkness, together with controls. Quantitative analysis of the starch and dextrin content of the leaves showed that application of sprays containing indoleacetic, naphthaleneacetic, indolebutyric, indolepropionic, and naphthoxyacetic acids resulted in marked increase in the rate of starch digestion. Phenylacetic acid resulted in only a slight increase, while naphthalene acetamide had no noticeable effect. Treatment of relatively old and mature leaves with these various chemicals either failed to stimulate, or inhibited to some extent, the hydrolysis of starch during a 12-hr. period of darkness following treatment. Application of these growth-regulating chemicals did not result in a noticeable increase in the rate of starch digestion in leaves kept at 62°-64° or at 90°-92°, but was effective at 74°-76° F. The sugar content of leaves kept in darkness increased appreciably for a period of time

following treatment with indoleacetic acid, a response previously observed in leaves treated with naphthaleneacetic acid."

Effect of growth substances on the absciss layer in leaves of *Coleus*. R. M. MYERS (*Bot. Gaz.*, 102 (1940), No. 2, pp. 323-338, figs. 9).—The experiments reported indicate that growth substances from the leaf blades influence the development of the absciss layer and the process of abscission, but their relation to abscission phenomena does not appear to be a simple one.

Seed treatments with talc and root-inducing substances. W. J. YOUTDEN (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 3, pp. 207-218, figs. 2).—In a study of wheat and soybean seeds treated in the dry state with various growth substances in different concentrations, no significant case was observed in either greenhouse or outdoor tests in which germination or growth exceeded that of the controls. Nineteen contrasts of talc-treated seeds with controls showed 15 instances in which the controls were superior and 1 tie. On an average the excess weight of the control plants was about 5 percent.

Effect of bile salts and oleates on the structural viscosity of protoplasm. R. M. MURK (Univ. Wyo.). (*Bot. Gaz.*, 102 (1940), No. 2, pp. 357-365, figs. 3).—*Spirogyra* filaments were used in these studies.

The relation between frost resistance and the physical state of protoplasm.—II, The protoplasmic surface, D. SIMONOVITCH and J. LEVITT (*Canad. Jour. Res.*, 19 (1941), No. 1, Sect. C, pp. 9-20, pls. 2).—In this further contribution (E. S. R. 84, p. 448), deplasmolysis injury, ductility of cytoplasmic strains, and the shape of injected oil drops on deplasmolysis were studied. The surface membrane of the protoplast of nonhardy cells stiffened when osmotically dehydrated, rupturing readily under tension. In hardy cells this stiffening was absent or arose only under much greater dehydration. The refractive index of the protoplasmic surface increased more on dehydration in nonhardy than in hardy cells. Plasmolysis maintained for some time induced a clumping of plastids and granules in nonhardy but not in hardy cells. A greater hydropathy in hardy than in nonhardy cells is thus indicated.

Water relations of plant cells, II. T. A. BENNET-CLARK and D. BEXON (*New Phytol.*, 39 (1940), No. 4, pp. 357-361, figs. 6).—Following the preliminary account (E. S. R., 77, p. 167), the authors confirm statements of T. G. Mason and E. Phillis^a that leaves may be subjected to considerable pressures without killing or injuring the cells. When increased pressure caused no further outflow of juice from the leaves the residue was still living and contained a large amount of water which, after killing, could be pressed out by very low pressures, with accompanying solutes. The origin of these alleged vacuolar and cytoplasmic saps is made more certain in experiments in which leaves with anthocyan-containing vacuoles in their cells were used. The curves relating volume of juice to pressure applied are of characteristic shape, and when extrapolated to zero volume cut the axis at a pressure equaling the hydrostatic pressure of the contents of those cells whose hydrostatic pressure at full turgor is lowest. The minimum hydrostatic pressure approximately equals the osmotic pressure of the solution required to cause limiting plasmolysis of the most readily plasmolyzable cells of the tissue. The numerical data strongly emphasize the inadequacy of the classical theory of water relations in the cell. It is pointed out that a continuous diffusion process is capable of maintaining in one phase of the system a hydrostatic pressure bearing no relation to the osmotic pressure. The nature of any processes of diffusion in the cell which might cause the setting up in the vacuole of a hydrostatic pressure as much

^aAnn. Bot. [London], n. ser., 3 (1939), No. 11, pp. 531-544, pl. 1, figs. 2.

as ten times that of the osmotic pressure is unknown, but it seems clear to the authors that the vacuolar osmotic pressure coupled with the necessary protoplasmic membrane completely impermeable to solutes is not the sole cause of the observed hydrostatic pressure.

A direct-reading flowmeter and its use in respiration studies with plants, S. G. GILBERT and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci.*, 51 (1941), No. 1, pp. 55-58, fig. 1).—In a study of root respiration it was found necessary to design equipment that would allow for rapid and accurate measurements of slow rates of flow for small volumes of gases. A diagram and construction details of the flowmeter designed are given. The principles of operation and method of calibration are presented. It is reported that 30 of the flowmeters described were constructed, and that they gave satisfactory quantitative measurements of gaseous exchange by the roots of living plants.

Floral initiation in Biloxi soybeans as influenced by photosynthetic activity during the induction period, M. W. PARKER and H. A. BORTHWICK. (U. S. D. A.). (*Bot. Gaz.*, 102 (1940), No. 2, pp. 256-268, fig. 1).—Initiation of flower primordia was limited by controlling photosynthesis during induction—in one case the CO₂ supply and in another the duration of high-intensity light. When no CO₂ was supplied during 8-hr. photoperiods, no initiation of primordia occurred. Plants receiving the normal CO₂ during 2, 4, 6, and 8 hr. of each photoperiod produced flower primordia in proportion to the duration of the natural air supply. Plants receiving only 1 hr. of high-intensity light during an 8-hr. photoperiod formed no flower primordia. Those receiving 2 hr. or more of high-intensity light during the photoperiod produced increasingly larger numbers of flower primordia with increase in the duration of high-intensity light. Increased CO₂ concentration in natural air augmented the floral initiation.

Effect of some environmental factors on floral initiation in Xanthium, L. K. MANN (*Bot. Gaz.*, 102 (1940), No. 2, pp. 339-356, figs. 5).—Floral induction may occur in vegetative plants of cocklebur (*X. pennsylvanicum*) after a single controlled photoinductive cycle. The effect of length of photoperiod during this single cycle is related to both temperature and light intensity. In general, the initiation of floral primordia and their developmental rate increased with the length of the photoperiod up to a rather definite point. By increasing the light intensity, the effectiveness of the single photoinductive cycle was increased, and apparently independently of the length of the photoperiod. The temperature during the photoperiod had a pronounced effect on the resultant stage of flowering. As the photoperiod lengthened, the temperature effect diminished. In plants brought into flower by increasing the length of a single dark period beyond 8.5-9 hr., the maximum stage of flowering was induced by dark periods of 12-15 hr. The photoperiods following or preceding a dark period pronouncedly affected floral initiation and development. The number of photoinductive cycles to which plants were exposed influenced the developmental rate of the floral structures.

Effect of light and temperature on floral initiation in cocklebur and Biloxi soybean, W. E. SNYDER (*Bot. Gaz.*, 102 (1940), No. 2, pp. 302-322, figs. 5).—In cocklebur (*Xanthium pennsylvanicum*), the conditions induced during photoperiod may be diminished to such a point that plants fail to initiate floral primordia when later subjected to a 12-hr. dark period. Under the same treatment Biloxi soybean exhibited no reduction in number of plants flowering, but there was a decrease in the number of nodes with flowers. In Biloxi soybean, short cycles of light and darkness or continuous light of low intensity, when inserted following the dark period of each photoinductive

cycle, considerably reduced the number of plants flowering as well as the average number of nodes per plant having flowers. This response appears rhythmical, and there are indications that use of cycles other than those under which the plant has been growing may cause ambiguous results. Use of short alternating periods of darkness and light may prove a more economical method of maintaining "short day" plants vegetatively than exposing them to continuous supplementary light of low intensity. The light intensity during these short periods apparently affects the response, and in cocklebur the temperature during treatment had little if any effect. A range of conditions imposed during the photoperiod of a photoinductive cycle can be directly correlated with the extent or degree of floral initiation shown by cocklebur under various treatments. After 18 short cycles, cocklebur may regain its capacity of being induced and develop flowers if subjected to 3 photoinductive cycles consisting of photoperiods of 2 hr. or more at 2,000 footcandles or 10 hr. of 100 footcandles and 14 hr. of continuous darkness. Moderate to high temperatures during the photoperiod and an increase in the intensity and duration of light favored establishment of the conditions brought about by the photoperiod as measured in these studies.

Length of day and temperature effects in *Rudbeckia*. A. E. MURNEEK (Mo. Expt. Sta. et al.). (*Bot. Gaz.*, 102 (1940), No. 2, pp. 269-279, figs 11).—Growth in height occurred and sexual reproduction was initiated and maintained in *R. bicolor* under a photoperiod exceeding 12 hr. In shorter photoperiods the plants remained as rosettes without flowering. Reproduction may be induced to various extents by exposure to a certain number of long days. Floral organs continue to develop and may function normally when plants are placed under short-day treatment. Stem elongation could only be maintained (not induced) on long photoperiods. Growth in height stopped promptly on switching from long to short photoperiods. Photoperiodic induction and inhibition may be combined in various ways by exposing plants to appropriate combinations of long and short days, thereby changing the size and form of the vegetative parts and the amount and character of development of reproductive tissues. Vegetative flowers and leaf rosettes are produced. High temperature may substitute for long days in inducing reproduction in the southern species *R. bicolor*, but not in *R. speciosa*, a more northern one. Stem elongation was not fostered under short days by raising the temperature.

Light and the growth of excised roots of *Datura*. W. J. ROBBINS (*Bul. Torrey Bot. Club*, 67 (1940), No. 9, pp. 762-764, fig. 1).—In these preliminary studies, growth in length under the experimental conditions was inhibited by exposure to light and associated with a thickening of the root and frequently also by production of long root hairs on the thickened portion. Several possible mechanisms for this behavior are suggested.

The effect of various wavebands of supplementary radiation on the photoperiodic response of certain plants. R. B. and A. P. WITHEROW. (Ind. Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 609-624, figs. 6).—Using varieties of three long-day plants (*Callistephus chinensis*, *Scabiosa atropurpurea*, and spinach) and four short-day plants (soybean, *Xanthium pennsylvanicum*, *Salvia splendens*, and *Tithonia speciosa*) grown in subirrigation nutrient solution, all of the first lot set macroscopic flower buds under red and yellow-green radiation, whereas spinach and *Scabiosa* failed to set buds under blue or short-day conditions. *Callistephus*, grown into the longer spring days, bloomed under a 12-hr. day length, the blue having only a slight effect in reducing flowering time. All short-day plants bloomed under short days and blue radiation, but failed to set buds under either red or yellow-green. With aster, *Scabiosa*, *Xan-*

thium, and soybean, all radiation treatments increased the total dry weight over that of plants under short day. Spinach increased in dry matter only under red and yellow-green, and the most pronounced increases generally occurred under the longer wavelengths. The longer wavelengths decreased the percentage of dry matter in all plants studied except *Scabiosa*, where there was little variation among the plants at harvest. The higher blue radiations also caused a decreased percentage of dry matter in spinach, *Xanthium*, and soybean. The height of all plants was increased under the red and yellow-green, but more so with the long- than with the short-day plants. The top : root ratio increased under the longer wave bands except for *Xanthium*, in which it decreased. With *Callistephus*, spinach, and soybean, the ratio was increased also by the blue but not as much as by the red. Leaf area for *Callistephus* and soybean was increased progressively from the short day through the blue, high-intensity blue, yellow-green, and red. The results are believed to indicate that the longer wavelengths are primarily effective in producing the flowering and vegetative effects secured under long-day treatments in both groups of plants. The initial photochemical step appears to be similar for all the plants investigated.

Increased stimulation of the alga *Stichococcus bacillaris* by successive exposures to short wave lengths of the ultraviolet, F. M. CHASE (*Smithson. Misc. Collect.*, 99 (1941), No. 17, pp. [1]+16. pls. 2. figs. 3).—Stimulation of multiplication was in about the same proportion for all four short wavelengths of ultraviolet on first stimulation, and in general the longer the wavelength the less effective were successive equal stimulations. The cell lengths decreased with each successive stimulative exposure. The greater the stimulated ratio of multiplication, the smaller and weaker the individuals became and the more altered their shape. In general, the cell volumes continually increased with wavelength for the stimulations. Cells stimulated by monochromatic wavelengths of ultraviolet were less sensitive to lethal exposures of this spectrum than were the controls.

Effects of monochromatic ultraviolet radiation on the growth of fungous spores surviving irradiation, A. E. DIMOND and B. M. DUGGAR. (Univ. Wis. and Conn. [New Haven] Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 906-914, figs. 7).—Using irradiated and control spores of *Rhizopus suinus* in three types of experiment (suspensions in hanging-drop cells, culture loops inoculated into Petri-dish potato-dextrose agar cultures, and mycelia from spores beginning after 36 hr. incubation), the growth rate of mycelium was identical, so far as could be determined. However, growth continued over a longer period in mycelium from spores surviving irradiation, resulting in the production of mycelial mats as much as 20 percent heavier than those from control spores.

Histological technic, including a discussion of botanical microtechnic, A. A. KRAJIAN (*St. Louis: C. V. Mosby Co.*, 1940, pp. 272, pls. 7, figs. 44).—A manual of general histological technic, with a chapter on botanical microtechnic, by E. D. Woodhouse (pp. 193-220).

Cytological and systematic investigations of the Gramineae [trans. title], N. KRISHNASWAMY (*Bot. Centbl., Beihefte*, 60 (1940), Abt. A, No. 1-2, pp. 1-56, figs. 115).—A taxonomic and cytological monograph on the grass family.

Uses of the Feulgen reaction in cytology.—II, New techniques and special applications, B. B. HILLARY (*Bot. Gaz.*, 102 (1940), No. 2, pp. 225-235, pls. 8).—Continuing the series (*E. S. R.*, 83, p. 465), the present contribution describes procedures for use with the squash technic, whereby anthers, ovules, and root tips are stained in toto, then spread out into a layer one cell thick by

crushing The chromonema, and not the matrix of the chromosome, are stained. The method was used with marked success after a trypan-lanthanum digestive method, which removes the chromosome matrix as well as other cell proteins. This crushing method is said to be the first to reveal at all clearly the chiasmata and individuality of the chromosomes in forms that have a diffuse stage at diplotene and diakinesis. Satellites were revealed with remarkable clearness. A counter stain of fast green is used to differentiate the nucleolus.

The hypocotyl in seeds, F. BLANK (*Chron. Bot.*, 6 (1940), No. 5, pp. 101, 102, figs. 2).—Observations on the tissue structure and behavior in germination.

Anatomical structure of the cottonseed coat as related to problems of germination, D. M. SIMPSON, C. L. ADAMS, and G. M. STONE (Coop. Tenn. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 734 (1940), pp. 24, figs. 10).—The mature semihard seed coat was found to consist roughly of epidermal, outer pigment, colorless, palisade, and inner pigment layers, anatomical details of which are described and illustrated. The principal requirements for initiation of germination include adequate water and oxygen supplies and favorable temperatures. The principal point of entrance of water to the embryo is through the chalazal opening, that through the micropyle being much slower. Certain seed lots were sensitive to prewetting or oversoaking and when placed in too moist a substratum remained dormant or germinated very slowly, too much water hindering air passage into the seed. Respiration was high during germination. Immaturity or underdevelopment of the seed may contribute to susceptibility to attack by micro-organisms. Seeds of different varieties grown under the same conditions differed in germination rate and degree of dormancy, but seeds from these same lots with seed coats removed showed no tendency to dormancy. Modification of the seed-coat structure by scarification or mechanical delinting may result in lowered germination under adverse conditions. Apparently any condition of the seed coat or substratum inducing an oversoaked condition and excluding oxygen may result in lowered germination. Seeds germinating well in the laboratory but highly sensitive to adverse conditions in the field were frequently encountered, and a vacuum method of detecting them was found to give better results than have been possible with the standard germination method. Essentially, this consists in subjecting acid-delinted seeds to reduced atmospheric pressure while immersed in water, after which germination tests are made as in the standard method.

The structure of cotton fiber, D. B. ANDERSON and T. KERR. (*U. S. D. A. and N. C. Expt. Sta.*). (*Chron. Bot.*, 6 (1940), No. 5, p. 104).—A digest of recent contributions on the primary and secondary cellulose wall formation (*E. S. R.*, 78, p. 168; 79, pp. 27, 169).

The morphology of the flowers of the Juglandaceae.—II, The pistillate flowers and fruit, W. E. MANNING (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 839–852, figs. 112).—This continues the study already noted (*E. S. R.*, 82, p. 316), dealing with all six genera.

Observations on morphological characters and flowering processes in the sunflower (*Helianthus annuus* L.), E. D. PUTT (*Sci. Agr.*, 21 (1940), No. 4, pp. 167–179, figs. 3).—Observations on different types of plants with respect to stem type and stem strength, and descriptions of the development of the sunflower head and individual flower, are presented. It is shown that the pollen tubes do not reach the ovary in many cases until late afternoon of the day after opening of the flowers. Floral development proceeded more rapidly on warm, clear days. The sunflower is not highly wind-pollinated. Natural crossing occurred in about 70 percent of cases. The dominance of vigorously

branching over single stem, pigmented over clear undercoat of seed, and fall frost resistance over susceptibility—each depending on a single factor without linkage—was shown in the F_2 cross between two inbred lines.

Ontogeny of medullary bundles in *Apium graveolens*, E. C. LAMBETH (*Bot. Gaz.*, 102 (1940), No. 2, pp. 400-405, figs. 12).—The White Plume and Golden Self-Blanching varieties of celery were used in this study.

Out of the furrow, C. THOM. (U. S. D. A.). (*Jour. Bact.*, 41 (1941), No. 1, pp. 1-15).—Summarizing this "presidential address," the author says: "I have used here material collected out of the furrow—definitely based upon a soil problem, to illustrate principles believed to be fundamental to the development of any project in applied microbiology. Boiled to a minimum, the requisites are: (1) A project statement explicit enough to define a concrete problem; (2) an ecologic analysis which covers all of the biologic factors already known and insures the development of those unique to the work in hand as a basis for describing or controlling micro-organic activity; (3) definite identification of any microbe encountered as an agent or introduced to accomplish a purpose."

Observations on the cell division of some yeasts and bacteria, G. KNAYSIL (Cornell Univ.). (*Jour. Bact.*, 41 (1941), No. 2, pp. 141-153, pls. 2).—Using a new method of making cell walls visible, observations on *Schizosaccharomyces pombe* and a number of common bacteria indicated fundamental differences in cell division. In yeasts there were no dark-field indications of cell division until it was completed, whereas in the bacteria a break in the cytoplasmic membrane presaged division. Bright-field observations showed that the deposition of cell-wall material preceded the breakup of the cytoplasm in yeasts and followed it in bacteria. In both groups two walls were deposited from the beginning, and there was no indication of division by simple constriction unless this be applied to the cytoplasm alone.

[Abstracts of bacteriological papers] (*Jour. Bact.*, 41 (1941), No. 1, pp. 19-103).—Abstracts begun on the pages indicated are included: A New Technic for the Determination of Specific Enzyme Systems in Bacteria, by M. L. Isaacs and M. Nussbaum (p. 24); Structural Differentiation Within the Bacterial Cell as Shown by the Electron Microscope, by S. Mudd, K. Polevitsky, and T. F. Anderson (p. 25); On the Biology of Certain Myxobacteria, by S. F. Snieszko, J. McAllister, and E. R. Hitchner (p. 26) (Univ. Maine); Physicochemical Behavior of Bacteria, by T. M. McCalla (p. 27) (Kans. State Col.); *Actinomyces antibioticus* nov. sp., A New Antagonist Against Micro-organisms, by S. A. Waksman and H. B. Woodruff (p. 32) (N. J. Expt. Stas.); Biotin Synthesis by Micro-organisms, by M. Landy and D. M. Dicken (p. 40); The Killing of Bacterial Spores by Shaking With Abrasive Materials, by H. R. Curran and F. R. Evans (p. 47) (U. S. D. A.); A Method for Determining the Hardness of Agar, by A. F. Roe (p. 48); An Experimental Evaluation of Plastic Screw Caps as Closures for Bacterial Cultures, by I. V. Shunk and F. H. Johnson (p. 48) (Univ. N. C. et al.); Growth-Factor Requirements of the Root-Nodule Bacteria, by J. B. and P. W. Wilson (p. 84); The Adaptation of the Root-Nodule Bacteria to Certain Substrates, by A. S. Phelps, R. H. Burris, and P. W. Wilson (p. 85); The Influence of Surface on the Formation of Sulfate by *Thiobacillus thiooxidans*, by K. G. Vogler and W. W. Umbreit (p. 85); The Stability of a Culture for Industrial Fermentation, by E. McCoy and E. B. Fred (p. 90); and The Effect of Copper on the Growth of a Strain of Baker's Yeast in Grain Wort, by A. M. Hanson and I. L. Baldwin (p. 94) (all Univ. Wis.); A Serological Study of *Brucina amylovora* Isolates, by R. P. Elrod and W. A. Starin (p. 87) (Ohio State Univ.); The Value of Citrate-Utilization as a Means for Differentiating Between the Genera *Escherichia* and *Aerobacter*, by C. N. Stark and W. R. Straughn, Jr.

(p. 88), A Survey of Substrates Dehydrogenated by Streptococci of Group B, by A. J. Wood and I. C. Gunsalus (p. 92), Variability in Streptococci of Group B, by J. M. Sherman, E. C. Chase, and C. F. Niven, Jr. (p. 101), and The Lactic Acid Fermentation of Various Kinds of Streptococci, by P. A. Smith and J. M. Sherman (p. 101) (all Cornell Univ.); The Effect of H-ion Concentration and of Ammonia on the Germicidal Efficiency of Chlorine, by G. R. Weber and M. Levine (p. 89), Some Characteristics of a Coli-like Organism Isolated From Chlorinated Water, by J. M. Coblenz and M. Levine (p. 89), and Microbial Thermogenesis in Decomposing Plant Materials, by A. G. Normal and R. E. Carlyle (p. 92) (all Iowa State Col.); Distribution of *Pseudomonas putrefaciens*, by H. F. Long and B. W. Hammer (p. 100) (Iowa Sta.); Floral Changes in the Fermentation of Spanish-Type Olives, by R. H. Vaughn and H. C. Douglas (p. 93) (Univ. Calif.); The Effect of Various Concentrations of Ethyl Alcohol on the Fermentation Rate of Distillers' Yeast, by F. H. Gallagher, W. H. Stark, and P. Kolachov (p. 91); and Serological and Cultural Study of Green-Fluorescent Bacteria, by J. J. Reid, R. G. Harris, J. Naghski, and E. C. Gatchell (p. 94) (Pa. State Col.).

Oxygen demand and oxygen supply, O. RAHN and G. L. RICHARDSON. (Cornell Univ.). (*Jour. Bact.*, 41 (1941), No. 2, pp. 225-249, figs. 5).—Knowledge of the oxygen consumption of multiplying bacteria being incomplete, a simple method was used for measuring the consumption per hour, and the results of more than 100 determinations are described and summarized. In a medium saturated with O_2 , all dissolved O_2 was exhausted when aerobic bacteria had multiplied to 2-10 million cells per cubic centimeter. The rate of O_2 diffusion thus is not nearly sufficient for the entire culture. The rate of multiplication of aerobic bacteria in open and sealed cultures proved identical until the O_2 was almost exhausted; after that not all types of bacteria behaved alike. A seal made of vaseline plus paraffin kept atmospheric O_2 away; mineral oil did not. Furthermore, the latter appeared to become toxic as soon as all O_2 was exhausted, although the bacteria recovered later.

Absorption spectra of the carotenoids in the red and brown forms of a photosynthetic bacterium, C. S. FRENCH (*Bot. Gaz.*, 102 (1940), No. 2, pp. 406-409, fig. 1).—"Bacteria may be ground with a hypodermic syringe to liberate the water-soluble constituents. Both aerobically grown (red) and anaerobically grown (brown) extracts of *Streptococcus varians* thus prepared have been examined spectroscopically. An extra band of 550 $m\mu$ is found in the red form."

A characterization of Bacterium radiobacter (Beijerinck and van Delden) Löhnis, A. W. HOFER. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 2, pp. 193-224 figs. 2).—Over three pages of references are included with this monographic study of the species.

GENETICS

A comparative study of the seasonal root development of some inbred lines and hybrids of maize, J. T. SPENCER. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 7, pp. 521-538, figs. 6).—A comparative study of the seasonal development of the root system of corn involved a double-cross hybrid, two single-cross hybrids, and the four inbred lines employed in making up the hybrids. The seminal root systems of the hybrids were larger than those of the inbred lines but died early in the growing season in both groups of strains. No consistent correlation was noted within either group of strains between development of seminal roots and development of the crown roots or tops. Marked differences were evident among the strains in number, dry weight,

and total length of main roots of the crown root systems. The maximum dry weight of the crown roots was reached at about the silking stage in five strains and possibly the week after silking for two strains. Striking differences were noted among the inbred lines in the ordinary development of lateral roots and in the amount of stimulated lateral root growth following injury of a main root by soil insects. The top:root ratio was nearly 2:1 for some strains at 2 weeks after planting but ranged from 12:1 to 23:1 among the strains at 15 weeks after planting. There was no close correlation among the inbred lines between dry weights of tops and of roots. About one additional whorl of crown roots was developed during each of the first 8 or 9 weeks of the growing season. Within all strains the number of pounds required to pull a corn plant from the ground was correlated most closely with the dry weight of the crown roots.

Cytological studies on some varieties frequently considered as hybrids between the plum and the apricot, J. R. KING. (U. S. D. A. and Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 215-217).—Studies of supposedly species hybrids, such as Rutland, Poe Royal Cotplum, Red Bud, Gustosa, Francis, Apex, Stanford, and Apricot-Plum, showed all to have a basic number of eight chromosomes, with little variation in chromosome size. Chromosomal irregularities were most frequent in Red Bud and, to a diminishing extent, in Rutland, Stanford, Apricot-Plum, and Gustosa. Abnormal spore formation varied according to the degree of irregularity in meiosis. The chromosomes of the Royal apricot and the Burbank plum included for comparison were also eight in number and showed infrequent cases of lagging of from one to two chromosomes. Although the variations noted were not sufficient to establish hybridity, they did suggest that Red Bud, Rutland, Stanford, and Apricot-Plum may be hybrids. External tree and fruit characters also indicated hybridity in some of the eight kinds. Attempts to produce similar hybrids by crossing the plum and apricot were fruitless.

A tetraploid lily, S. L. EMSWELLER and P. BRETHERLEY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 1006).—An account is presented of the production of tetraploid plants of *Lilium formosanum* by immersing the apical growing points of diploid plants in colchicine solutions. Some of the tetraploids flowered and a few set seed. The flowers, leaves, and stomata of the tetraploids were larger than those of the diploid forms.

Inheritance in the carnation, *Dianthus caryophyllus*.—I, Inheritance of flower color, G. A. L. MEHLQUIST. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1019-1021).—As a result of crossing studies, six independent factors concerned with self-colors were identified as follows: *Y* and *I* control, respectively, the production of yellow and ivory anthoxanthin, *I* being epistatic to *Y*. *A*, the basic anthocyanin factor, is normally effective only in the presence of both *I* and *Y*. Partial anthocyanin is possible in the absence of *I*, the resultant color varying from salmon-yellow to maroon, depending on what anthocyanin factors are present. *S* controls the production of scarlet-red anthocyanin, its recessive allele *s* dilute red or salmon. *R* controls the production of crimson-red anthocyanin, and its recessive *r* permits the development of scarlet-red anthocyanin only. *M* modifies the colors of the red series to the corresponding colors of the magenta series and has no effect in the acyanic group and probably little effect in the transition group.

The intensity and kind of selection actually practiced in dairy herds, D. M. SEATH. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 10, pp. 931-951, figs. 2).—Study was made of the influence of culling in 147 herds selected at random from 49 Iowa Cow Testing Associations and 37 Kansas herds. For various reasons, 28.6 percent of the cows in the Iowa herds and 30.9 percent of

the cows in the Kansas herds which had a record did not appear for the next year's test in the same herds. It thus appeared that the productive life of the cows was 3.50 and 3.24 yr., respectively. The amounts of culling in different years and herds and according to breeding were associated with production, environmental conditions, and disease. It was estimated that yearly production increase in the herd average from culling was from 25 to 38 lb. of milk and from 0.28 to 1.55 lb. of butterfat.

Some factors affecting the progeny testing of rams, R. W. PHILLIPS, R. G. SCHOTT, W. V. LAMBERT, and G. W. BRIER (*U. S. Dept. Agr. Cir. 580 (1940), pp. 18, figs. 6*).—An analysis of the variability of fleece weight and length and body weight of more than 700 yearling ewes each of the Columbia, Corriedale, and Rambouillet breeds for the period 1925 to 1936, inclusive, indicated the desirability of comparing rams by progeny reared in the same year and making appropriate adjustments if this was not possible. The variability further made it desirable to mate all rams tested to comparable groups of ewes or to employ suitable correction factors. A simple and relatively rapid method for comparing the progeny of rams under field conditions is proposed.

Comparison of Rambouillet and Corriedale sheep, J. M. JONES, W. H. DAMERON, B. L. WARWICK, and S. P. DAVIS. (*Tex. Expt. Sta. and U. S. D. A. (Southwest. Sheep and Goat Raiser, 11 (1940), No. 1, pp. 28-30*).—Although Corriedale ewes produced heavier fleeces with less shrinkage than Rambouillet ewes, the latter ewes were about 16 lb. heavier at comparable ages and weaned more and heavier lambs.

Quintuplet-bearing goats back to normal (*Jour. Hered., 32 (1941), No. 1, pp. 5-6*).—The production of three sets of triplets and two sets of quintuplets by a doe and the normal expectation of multiple births in the progeny of two ♂s and three ♀s in one set of quintuplets are noted.

Genetic studies of skeletal dimensions and their relation to body weight and egg production in the domestic fowl (*Gallus domesticus*), J. H. QUISENBERRY, E. ROBERTS, and L. E. CARD. (*Univ. Ill. (Poultry Sci., 20 (1941), No. 2, pp. 104-120, figs. 2*).—In the F_2 generation from Dark Cornish \times White Leghorn fowls a definite significant correlation was found between low egg production, large egg size, and diameter of the tibia, although these characteristics were not significantly correlated in the parental breeds. Measurements of the length, diameter, and weight of several long bones and other portions of the skeletal structures of the F_2 birds were highly correlated with mature weights (0.64 to 0.73). Correlations between the measurements and body weight in the parental breeds and F_2 s were significant and high. The reciprocal F_1 crosses differed so significantly in egg production (mean with Leghorn sire, 163.67 and with Cornish sire, 140.60) as to suggest the influence of a sex-linked factor for broodiness carried by the Cornish parents (*E. S. R., 70, p. 605*). Even with the weights taken at 2-week intervals there were no significant differences up to from 8 to 12 weeks between the two parental breeds, but after 16 weeks striking differences in growth were apparent.

Inheritance of broodiness in Rhode Island Reds, F. A. HAYS (*Massachusetts Sta. Bul. 377 (1940), pp. 11*).—The degree of broodiness in fowls measured by the number of broody periods in the first laying year and those succeeding it was found to depend upon two complementary dominant non-sex-linked genes. These results were derived from study of the broody periods exhibited by 1,767 Rhode Island Red daughters of 72 sires and 210 dams. The number of times broody during the first year served as a reliable selective method for the occurrence of broodiness. The percentage of broody daughters of full brothers and sisters was 20 percent in both cases, and correlations between

the broodiness of the progeny and sisters of the dams and sires were about 0.7 ± 0.04 in both cases, showing no sex linkage. The complete elimination of the broody trait was retarded by the deferment of broodiness until the third year in 8.51 percent of the dams.

Inheritance of shell finish in Single Comb White Leghorns, L. W. TAYLOR and I. M. LEENER. (Univ. Calif.). (*Jour. Hered.*, 32 (1941), No. 1, pp. 33-36, figs. 2).—Glossy and chalky finish of the shell of White Leghorn eggs was found to be inherited as a single pair of alleles with chalky dominant. There were, however, some rather large deviations in the ratios, such as F₂s of 75 birds laying chalky : 35 laying glossy eggs, which suggested the action of modifying factors or the incomplete dominance of the chalky character.

The nature of disproportionate dwarfism, with special reference to fowl, W. LANDAUER. ([Conn.] Storrs Expt. Sta.) (*Sigma Xi Quart.*, 28 (1940), No. 4, pp. 171-189, figs. 11).—A review of the various forms of dwarfism in the fowl, including bantam, thyroid abnormality, Mn and riboflavin deficiencies, nonhereditary micromelia, semilethal shortening of the long bones, and creeper.

A new type of polydactyly in the fowl, D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 1, pp. 2-5, figs. 2).—A new type of polydactyly (E. S. R., 83, p. 327) designated as "duplicate" was found to be due to an autosomal dominant gene probably allelic to the usual type of polydactyly, thus forming a multiple allelic series. The new character was discovered in a heterozygous bird in which the mutation probably had first occurred. Various types of matings with duplicates gave expected results except that 2 normals were produced among 144 progeny of heterozygous \times homozygous duplicates. The progeny of birds heterozygous for both forms of polydactyly more nearly approximated a 3 : 1 than a 15 : 1 ratio, suggesting the allelic relation of these two genes.

Unusual plumage of domestic mallard ducks, E. A. McILHENNY (*Jour. Hered.*, 32 (1941), No. 1, pp. 18-21, fig. 1).—Among 11,972 ducklings selected for many years for normal plumage there were produced, in 1939 and 1940, 42 with golden-white and 52 with dark plumage. Those with the light plumage produced only normal-colored progeny.

Successive generations of vitamin E-low rats, G. A. EMERSON and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 159-162).—Rats on diets low in vitamin E were found to show in successive generations decreased growth rates, a delay in maturity of ♀s, and sterility in ♂s with fertility only maintained by single doses of wheat-germ oil. Coarse, sparse, yellowish fur and dystrophy occurring on E-low diets appeared progressively earlier in successive generations. The fourth-generation animals receiving daily doses of 0.15 cc. of wheat-germ oil did not show the deficiencies and were normally fertile.

Carbon dioxide tension and its relation to the quiescence of spermatozoa in vivo, L. B. SHETTLES (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 318-322).—The CO₂ concentration of the tissues of the rat was much lower than that necessary to immobilize spermatozoa in vitro. The concentration of tissues determined by the method of I. S. Danielson and A. B. Hastings⁴ ranked in the following decreasing order: Liver, muscle, vas deferens, epididymis, and testis. CO₂ concentrations of approximately 20 percent in O₂ were required to immobilize spermatozoa in a hanging drop. Revival of motility depended on the length of time the spermatozoa were immobilized, but all concentrations producing immotility were toxic provided the sperm were exposed long enough.

⁴ *Jour. Biol. Chem.*, 130 (1939), No. 1, pp. 349-356, fig. 1.

The effects of low temperature and acclimatization on the respiratory activity and survival of ram spermatozoa, M. C. CHANG and A. WALTON (*Roy. Soc. [London], Proc., Ser. B., 129 (1940), No. 857, pp. 517-527, figs. 2*).—A temperature as low as 1° C. was not harmful to ram spermatozoa provided the cooling was done gradually, sudden cooling being deleterious. Optimum storage results were obtained when the temperature was lowered 5° at intervals of 2 hr. each. There was no temperature shock on warming slowly or rapidly. Measurements of the survival were based on the O. consumption of samples of ram semen collected in an artificial vagina. There was close agreement between the temperature effects on respiration and motility of the sperm observed microscopically. The optimum methods of cooling and storing permitted retaining 74 percent of the original activity for 6 days, and, in exceptional cases, 87 and 82 percent of the activity was maintained for 13 and 14 days, respectively.

Thermo-regulatory function of rat scrotum.—I, Normal development and effect of castration, F. N. ANDREWS. (*Mo. Expt. Sta. and U. S. D. A.*). (*Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 3, pp. 867-869, fig. 1*).—The thermo-regulatory function of the scrotum of mature rats was gradually but not immediately lost following castration. Immature rat scrota did not show the temperature contractility. Measurements of scrotal contractility were made by attaching a thread to the scrotum and the recording arm of a kymograph and immersing the anesthetized rat in water with controlled temperature.

Androgens and uterine weight in the immature rat, R. R. GREENE and S. C. HARRIS (*Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 1, pp. 34-37*).—Doses of 0.5 mg. of testosterone and 1.5 mg. of dehydroandrosterone caused increases of 22.8 and 24.9 percent, respectively, in the uterine weights of ♀ rats in 6 hr. Increases in uterine weight resulting from 0.1 mg. of testosterone were not significant. The estimates of the urinary androgens secreted by the ♀ are shown to be a possible source of error in assaying for the oestrogens present unless the androgens are separated from the sample.

Twenty-four hour response to androgens in the immature male rat, R. R. GREENE and M. W. BURBELL (*Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 3, pp. 780-782*).—Increases in the prostate and seminal vesicle weights of 32- to 38-day-old rats were induced 24 hr. after treatment with several single subcutaneous injections of testosterone propionate. Increased weights occurred with doses above 0.5 mg. and were proportional to the dose used. These androgens have a weight-increasing effect on the ♂ accessories similar to the influence observed in the rat uterus, noted above.

There were 131 ♂ rats used in the tests.

A dosage response equation for androgen assay by the chick comb method, F. HOLLANDER, E. KLEMPNER, and R. T. FRANK (*Soc. Expt. Biol. and Med. Proc., 46 (1941), No. 1, pp. 1-5, figs. 2*).—The comb growth response of chicks to androgens (*E. S. R., 81, p. 197*) was improved in reliability by bringing in the necessary curvature of the relations and taking account of body weight changes and sex. The single dose equation evolved was

$$A = 1.061W - 0.0043W^2 - 0.397B_0 - 0.267B + 14.75 \frac{N_m}{N_m + N_f} + 18.54 \frac{N_f}{N_m + N_f}$$

In this equation A represents the micrograms (γ) of crystalline androsterone, W the comb growth weight at 10 days, B_0 and B the third and tenth day body weights, and N_m and N_f the number of ♂s and ♀s, respectively. The observations were made in 10 series on 1,439 chicks.

Effect of "Prospermin" on immature and mature hypophysectomized and normal male rats, J. H. LEATHEM (*Soc. Expt. Biol. and Med. Proc., 45*

(1940), No. 1, pp. 497-499).—Sperm formation and maintenance of spermatogenesis was induced in hypophysectomized mature and immature ♂ rats by Prospermin. In the studies with immature ♂s, doses of 1 mg. were given daily for 30 days and the seminal vesicle and testicle weights were increased; but in the immature normal animals the testis weights were not significantly different from the controls. However, under such conditions the seminal vesicle weights were abnormally high.

Androgen in the woodchuck hibernating gland, J. E. SWEET and W. H. HOSKINS (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 60-62).—Bioassay for androgens showed the hibernating gland of the woodchuck to contain 1 International Unit of androgen in 50 gm., which is equal to the concentration in bull testis, the richest tissue source known. Alcohol-ether extracts showed the ether to be inert. Assays were made of the material applied by inunction to the capon comb.

Response of sex characters of the adult female starling to synthetic hormones, E. WITSCHI and N. W. FUGO (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 10-14).—Tests of the gynogenic effects of synthetic hormones on normal and castrated ♀ starlings showed that oestradiol, oestrone, oestriol, and stilboestrol stimulate exclusively oviduct growth. In contrast, androsterone and testosterone propionate stimulated all secondary sex characters, but progesterone did not influence any of them. The presence or absence of the ovary had no influence on the development of the ducts, but there was an indication of a depressive effect on the ovary, suggesting a possible inhibition of the gonadotropic hormone production in the pituitary. Testosterone and oestrone did not have antagonistic effects, since both together produced a greater influence than either alone on oviduct growth. The doses of the hormones were administered 10 times on successive days. The oviducts of untreated control birds weighed less than 25-50 mg., but with the oestrone treatment weights over 3,000 mg. were induced.

Modifications of bones of animals receiving sex hormones, W. U. GARDNER (*Anat. Rec.*, 76 (1940), No. 2, Sup. 2, pp. 22-23).—Inbred strains of mice showed individual differences in the response of bone changes to the administration of oestrone, equilin benzoate, equilenin benzoate, triphenylethylene, and stilboestrol which were not prevented by progesterone but were inhibited by testosterone propionate. Sex differences in the ash content and Ca:P ratio of the femurs were noted which were influenced by the sex hormone.

The breaking strength of femurs of mice receiving estrogens, W. U. GARDNER (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 230-232, fig. 1).—The breaking strength of the femurs of oestrogen-treated mice, noted above, was relatively one-third greater than the breaking strength of the bones of the controls. However, a considerable although smaller difference was noted in the breaking strength of the two femurs from the same animal.

The influence of age, hypophysectomy, thyroidectomy, and thyroxine injection on simple reaction time in the rat, E. B. BRIDY. (Univ. Mo.). (*Jour. Gen. Physiol.*, 24 (1941), No. 4, pp. 433-436, fig. 1).—Although the metabolic rate of rats was increased by thyroxine injections, the reaction time to an electric shock was not significantly altered. There was a slight decrease in the time of reaction in hypophysectomized and thyroidectomized animals. The time was delayed in immature animals, but it increased rapidly with increasing age.

Effects of progesterone upon the uterus of the mouse, C. W. HOOKER (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 270-272).—Injection of ovariectomized ♀ mice with 0.25 or 0.5 mg. of progesterone caused responses

in the histology in all tunics of the uterus whether the progesterone was given singly or with oestradiol benzoate or testosterone. The nuclei of the cells of the uterine tunic were larger in normal than in pregnant or lactating mice. The small doses of progesterone proved as effective as larger doses, and the responses were almost as marked at 3 days as at 6 days after the treatment.

Effect of chronic progesterone overdosage on the female accessory sex organs of normal, ovariectomized, and hypophysectomized rats, H. SELYE (*Anat. Rec.*, 78 (1940), No. 2, pp. 253-271, pls. 3).—Studies of the effects of injections of crystalline progesterone showed that all typical corpus luteum hormone actions on the oviduct, uterus, vagina, and mammary gland were exerted in the intact rat. Except in the mammary gland the action in the hypophysectomized animal was the same, indicating that the effects were produced independently of the ovary and hypophysis.

Growth of the mammary glands in hypophysectomized mice, W. U. GARDNER (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 835-837).—To test further the effects of hormones in inducing mammary growth in hypophysectomized mice (*E. S. R.*, 82, p. 470), slight growth of mammary glands was induced in some hypophysectomized ♂ rats with 15 daily subcutaneous injections of desoxycorticosterone acetate, progesterone, and oestradiol dipropionate, but more extensive and rapid proliferation of the ducts occurred when desoxycorticosterone acetate or progesterone was injected with the oestradiol dipropionate. The experiments were conducted with 101 hypophysectomized mice from 30 to 80 days old.

Involution of thymus during pregnancy in young mice, E. D. PERSIKE, JR. (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 315-317).—Pregnancy in young mice caused from 45 to 80 percent involution of the thymus weight as compared with nonpregnant sisters of the same age serving as controls. It seemed significant that the post-partum mice were generally heavier in body weight than their litter-mate controls.

Effect of thyroidectomy upon sexual behavior of the male bovine, W. E. PETERSON, A. SPIELMAN, B. S. POMEROY, and W. L. BOYD. (*Univ. Minn.*). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 16-17).—Thyroidectomy of a bull at 4 mo. of age had no effect on spermatogenesis or the production of normal sperm which were successfully used in artificial insemination. However, after 60 days the bulls showed decreased exercise and complete absence of libido. Normal activity and sexual behavior were restored within 3 days by the oral administration of 25 gm. of desiccated thyroid and by dinitrophenol and testosterone propionate.

Early recognition of the freemartin condition in heifers twinborn with bulls, W. W. SWETT, C. A. MATTHEWS, and R. R. GRAVES. (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 8 pp. 587-623, pls. 16, figs. 3).—Study of the weights, measurements, and morphology of organs and glands of 17 heifers born twin with a bull led to the conclusion that there was little chance that such heifers would be sexually normal. Positive identification of sterility could not be made until breeding age was attained, but freemartins could generally be distinguished by the following characteristics: Less rapid growth than normal ♀s of the breed, retarded or atypical development of the mammary gland after 1 mo. of age, enlarged clitoris, presence of a fold of skin sometimes containing a cord extending from the rear attachment of the udder along the median plane of the body to the navel, and less than normal udder capacity. Study of the relative size of the organs and body parts in comparison with the average for normal heifers of the Jersey and Holstein breeds slaughtered up to 18 mo. of age showed all that were kept to breeding age to be sexually abnormal and incapable of repro-

duction. Although the organs of freemartins were actually smaller than those of normal helpers, they were about 10 percent greater in proportion to total units of weight and measurement. Only 2 of the 17 showed normal sexual development for their age, but these died under 2 mo. of age.

The literature on freemartins is summarized.

FIELD CROPS

[Agronomic research in California] (*California Sta. [Bien] Rpt. 1939-40*, pp. 6-7, 89, 91-94, 100-102, 111-112, 112-113, 114, 115, 146).—Noteworthy accomplishments are again (E. S. R., 81, p. 199) reported on briefly from breeding research with corn for heat resistance, rice, and snap, pink, red kidney, lima, and mung beans; production of approved seed; rotation and fertilizer experiments with sugar beets; cultural experiments with rice and flax; storage tests with sweetpotatoes; inoculation tests with garbanzos and development of a new method for handling and distributing cultures of strains of the bacteria; studies of burnet (*Sanguisorba minor*), an herbaceous perennial promising to suppress Klamath weed; and weed control research centered on the use of Sinox (E. S. R., 83, p. 55) and on factors affecting the diffusion of carbon disulfide injected into the soil to kill rootstocks of perennials.

[Field crops research in Delaware]. (Partly coop. U. S. D. A.). (*Delaware Sta. Bul. 227 (1940)*, pp. 11-13, 20).—Fertilizer experiments, including tests of nitrogen carriers, with wheat and sweetpotatoes, nutrient absorption by sweetpotatoes as affected by fertilizer placement, yield tests of corn hybrids and varieties, trials of barley and yellow-seeded soybean varieties and selections, breeding work with wheat, and selection and improvement of white clover and Korean lespedeza are reported on briefly by C. E. Phillips, G. L. Schuster, J. M. Watkins, and G. M. Gilligan.

[Field crops research in Kansas, 1938-40.] (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1938-40*, pp. 36-41, 43-55, 56-57, 58-59, 62-63, 69, 131-135, 137-138, 139-140, 141-142).—Brief reports are made on results obtained by R. I. Throckmorton, F. E. Davidson, C. R. Porter, A. B. Erhart, H. H. Laude, L. P. Reitz, E. G. Heyne, C. O. Swanson, J. W. Zahnley, R. W. Jugenheimer, C. O. Grandfield, K. L. Anderson, A. L. Clapp, F. C. Fenton, E. G. Bayfield, J. E. Anderson, E. C. Miller, J. C. Frazier, L. R. Quinlan, A. L. Hallsted, L. E. Wenger, F. L. Timmons, W. R. and A. F. Swanson, H. J. Haas, A. E. Lowe, J. B. Kuska, E. H. Coles, and T. B. Stinson from agronomic and related studies (E. S. R., 80, p. 756) at the station, substations, and soil and crop experimental fields, including varietal tests with winter and spring wheat, corn and hybrids, popcorn, oats, barley, grain sorghum, sorgo, flax, soybeans, cowpeas, alfalfa for yield, winter hardiness, and wilt resistance, sweetclover, and miscellaneous grasses and legumes and forage mixtures; breeding work with corn, wheat, oats, barley, grain sorghum, sorgo, flax, alfalfa, buffalo grass, and pasture grasses; inheritance studies of factors affecting quality of wheat, including wheat meal fermentation time and pearling tests and protein and carotene determinations on nursery-grown varieties and hybrids; cultural (including planting) experiments with wheat, corn, barley, flax, oats, sweetclover, grain sorghum, sorgo, soybeans, blue grama, and buffalo grass; rotation, fertilizer, mulching, cultural, and seed piece experiments with potatoes; different types of crop rotations; fertilizer tests and comparison of seedbed preparations with wheat; tests of methods of fallow and of the influence of wind erosion control methods, i. e., listing and chiseling in the winter or early spring, on the yield of wheat; studies of heat and drought tolerance in corn and winter and spring wheat; the study of the relation

between the environment of the wheat crop and its growth and yield; effects of a nurse crop on sweetclover; alfalfa investigations on breeding for combined disease resistance, including correlation of root reserve storage with other physiological processes and time of cutting, seed production, and varietal improvement and adaptation; responses of different crops to lime fertilization and other soil fertility treatments; methods of handling sweetclover in rotation with wheat, kafir, and oats; palatability experiments with grain sorghums and sorgo as fodder feed; effects of loss of soil moisture by evaporation on sorghum yields; wheat investigations, including studies of factors influencing the quality of wheat and of grain sorghum during farm storage in different types of bins, varietal factors influencing milling and baking quality of wheat, and tempering factors affecting the quantity and quality of flour, e. g., effects of moisture content and time, measurement of dough plasticity, effects of atmospheric conditions on experimental milling, temperature rise in tempered wheat, and study of mill-streams; pasture research, including management of livestock and effects of fertilizers and burning on bluestem pastures, tests with mixtures of cultivated grasses, effects of time and method of seeding upon stands of native grasses, and seed production and germination studies with buffalo grass; and weed control studies, including methods of killing bindweed with chlorate, cultivation, smother crops, and other practices, physiological study of bindweed in relation to its control, including its botanical nature and development and modification by cultivation, seasonal variations in place and extent of reserve storage, and seed viability, and effects of bindweed on wheat and oats yields, and use of kerosene in dandelion control in bluegrass and Bermuda sod.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 11, pp. 1, 2, 7, 8).—Brief reports of progress are made from current research in the following articles: Once Poor Soil Yields Good Corn at Holly Springs, by E. B. Ferris (pp. 1, 8); Superphosphate and Basic Slag Profitable Phosphorus Sources, by C. Dorman (p. 2); Fall Planted Sugarcane Found Subject to Cold Weather Damage in Periods of Extremely Low Temperature, as in 1940, by I. E. Stokes (p. 2) (U. S. D. A.); Use of Chemicals To Kill Weeds—Good for Johnson Grass, by O. A. Leonard (pp. 2, 7); and Hemp Tests Show Abundant Yield and Low Cost Per Ton at Stoneville Substation, Problems Remain Decortication, Markets, by H. C. McNamara and E. A. Currey (p. 7).

Agronomic farm practices in Franklin County, North Carolina, J. F. Lutz and C. B. Williams. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Tech. Bul.* 66 (1940), pp. 48, figs. 11).—A survey of farm practices in 1936, covering 73 farms on the Cedar Creek watershed in Franklin County, was made to determine to what extent farmers in the area were complying with recommended practices, such as terracing, strip cropping, rotations, fertilizers, and others deemed essential to a good soil-conserving and improving system of farming.

Farmers in the area were practicing a cash system of farming with more than two-thirds of their total cultivated land in row crops. Since only one-eighth of the cultivated land grew a legume crop in 1935, and 70 percent of these legumes were harvested, only 1 acre in about 25 was left for soil improvement. About one-third of the cultivated land was not terraced and much of the terraced land was not contour-farmed or strip-cropped. Effects of such methods were demonstrated by the fact that practically all soils on the upland had lost from 25 to 75 percent of their top soil, and a large acreage was beginning to be gullied. The extent of depletion was reflected in the low crop yields, e. g., cotton made only 260 lb. per acre and corn only 18.4 bu.

The amounts of fertilizer (about a 3-8-3) used on cotton and on corn were about 40 and from 25 to 30 percent, respectively, of the amounts recommended. Tobacco received about as much fertilizer as was recommended, but the 3-8-4 used was inferior to the indicated analyses. The station had recommended 4 percent nitrogen and potash in corn and cotton mixtures and 6 percent or more potash in tobacco mixtures. On certain farms higher analysis fertilizer was more economical on corn and cotton, but the higher percentage of potash in the tobacco fertilizer was not beneficial in this area because the soils were derived from rocks extremely high in potassium-bearing minerals.

All soils in the area lack lime, and many had never received any calcium except when applied in mixed fertilizers. Part of the benefits due to liming, green manure crops, and rotation were absent because of the sensitivity of tobacco to these practices. The farm practices are deemed as good as in other similar areas of North Carolina, but unless improvement is made in many practices, permanent agriculture probably cannot be realized in the area.

Long-time yield record, tillage, and rotation experiments at the Dickinson Substation, L. MOOMAW (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 3, pp. 9-11, fig. 1).—Yields of wheat, oats, barley, ear corn, and fodder by years since 1907 are tabulated and discussed.

[Field crops research in South Carolina]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt.* 1940, pp. 27-37, 39-47, 93-95, 104-109, 111-121, 127-130, 138-139, 142-146, 151-156, 167-168, 176-178, 182-183, figs. 10).—Progress reports (E. S. R., 83, p. 490) are made again from agronomic experiments at the station and substations by G. B. Killinger, H. P. Cooper, R. W. Wallace, R. L. Smith, W. R. Paden, F. Moser, J. B. Edmond, G. H. Dunkelberg, C. S. Patrick, E. D. Kyzer, J. E. Love, R. L. Jones, J. H. Mitchell, W. H. Jenkins, E. E. Hall, F. M. and D. C. Harrell, J. O. Ware, J. D. McCown, J. R. Mattison, J. F. Bullock, T. W. Graham, N. McKaig, Jr., W. A. Carns, A. B. Bowen, W. C. Earnes, and O. B. Garrison, comprising variety tests with cotton, corn (and hybrids), oats, wheat, barley, rye, grain sorghum, sorgo, soybeans, peanuts, and pasture grasses; breeding work with cotton; genetic studies with cotton also concerned with inheritance of *Fusarium* wilt and petal spot, leaf shape, plant color, and seed covering relationships in crosses with upland and sea-island cotton; fertilizer experiments with corn, oats, and soybeans; fertility and pH levels for lespedeza; a comparison of Oototan and Biloxi soybeans and cowpeas for hay; an adaptation trial of Alyce clover as a hay crop; establishing and maintaining annual clovers in carpet grass pastures; use of electricity in curing and storing sweetpotatoes; studies of electricity in sweetpotato plant production, including influence of type of hotbed cover, horizontal spacing of heating cable, soil temperature, "crowded" and regular bedding of roots, and influence of bedding media; influence of height of ridge on yield and shape of Porto Rico sweetpotatoes; fertilizer and nutrition studies with cotton dealing with placement, time and rate of applying potassium and other fertilizers, nitrogen and potassium carriers with and without lime and magnesium carriers, granulated complete fertilizers, rates of applying manure, and yields after winter legume covers; the comparative value of a green manure crop of rye and hairy vetch, manure, and their combination in cotton production; response of cotton on Grady sandy loam after various fertilizer and lime treatments and at different pH levels of Cecil sandy loam; tobacco experiments, including fertilizers for plant beds and effects of different rates of application and forms of sulfur, potash, calcium, and magnesium on yield and quality; date and depth of planting tests with potatoes; green manure-fertilizer experi-

ments; and a study of the effects and economy of heavy initial fertilizer treatments on permanent pastures.

[Agronomic experiments in Wyoming]. (Partly coop. U. S. D. A. et al.). (*Wyoming Sta. Rpt.* 1940, pp. 4-7, 8-9, 31-36, 37-38, 39-42, 43-45).—Experiments (E. S. R., 83, p. 481) with field crops, range, and pastures at the station and substations, reported on briefly, comprised variety tests with winter and spring wheat, oats, barley, grain sorghum, sorgo, millet, corn (and hybrids), potatoes, alfalfa for yield and wilt resistance, and miscellaneous forage grasses, clovers, and pasture mixtures; certification work with potatoes; dusting v. spraying sulfur to control potato psyllids; cultural (including planting) experiments with corn, potatoes, sugar beets, crested wheatgrass, brome grass, and alfalfa; effect of a shelterbelt on yields of corn, oats, and crested wheatgrass; fertilizer trials with potatoes (phosphate), alfalfa, sweetclover, barley, and sugar beets; ordinary, manured, and fertilized crop rotations; methods of preparing seedbeds for different crops; trials of alfalfa in mixtures with grasses; response of alfalfa to cultivation, manure, and T. V. A. phosphate; pasture studies; tests of range grasses; the merits of sagebrush removal as a range improvement measure; surveys of range vegetation, with especial reference to density in different seasons; grazing capacity of abandoned farm land v. virgin land; and control of cactus by crushing with a heavy roller.

[The results of field crops experiments on Wyoming State experiment farms]. (Partly coop. U. S. D. A. et al.). (*Wyoming Sta. Bul.* 243 (1941), pp. 5-7, 9-11, 11-14, 15-18, 23-24, 25-34, 35-36, 38-39, 40-41, figs. 17).—Practical results are reported from agronomic experimentation on the experiment farms near Afton, Archer, Eden, Gillette, Lyman, Sheridan, Torrington, and Worland, including variety tests with oats, barley, wheat, corn and hybrids, alfalfa, sorgo, grain sorghum, soybeans, forage crops, and pasture and meadow grasses and mixtures; cultural (including planting) tests with corn, winter wheat, alfalfa, sweetclover, crested wheatgrass, and sugar beets; fertilizer experiments with barley, alfalfa, wheat, and sugar beets; growing sugar beets on nematode-infested soil; crop rotations; the effect of tillage and green manure on yields in a rotation including corn, wheat, and oats; effects of cultivating and manuring grass and alfalfa meadows; yields of alfalfa and grasses and clovers in mixture v. alone; effect of a shelterbelt on crested wheatgrass yields and of pasturing rye in the fall on yields next spring; improvement of natural range with drought-resistant grasses and other methods; and the control of quackgrass by cultivation.

Developmental morphology of the growing point of the shoot and the inflorescence in grasses, M. W. EVANS and F. O. GROVER. (U. S. D. A., Ohio Expt. Sta., et al.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 7, pp. 481-520, figs. 21).—Studies were made of the vegetative growing points of quackgrass, perennial ryegrass, canary grass, timothy, tall oatgrass, orchard grass, foxtail millet, and teosinte, eight species belonging to seven tribes; of the morphological changes taking place in the growing point during its transition from the vegetative to reproductive phase; and of the organization and early development of the inflorescence. Indications were that the inflorescence of all grasses are fundamentally alike in the early stages of their development. When the growing point is in a vegetative condition, ridges appear distichously in acropetal succession and from them the leaves finally grow. When environmental conditions become favorable for reproductive development, development of the ridges ceases and protuberances, the homologs of vegetative buds, develop in the axils of these ridges. In the distal part of the rudimentary inflorescence, protuberances appear without formation of subtending ridges. The final form

of the mature inflorescences of different species varies widely, due to modifications in the manner in and extent to which branching of the earliest protuberances occurs and to the extent to which their axes become elongated. Literature cited includes 88 references.

Nebraska pastures—seeding and management, A. L. and E. F. FROLIX (*Nebraska Sta. Cir. 67 (1941), pp. 32, figs. 19*).—Practices involved in establishing permanent pastures, i. e., seeding period, mixtures, companion crops, seed-bed preparation, method and depth of and care after seeding, sodding buffalo grass, and regrassing abandoned land, and their management by grazing, mowing weeds, burning, fertilizing, pasture furrows, improving unproductive permanent pastures, and reseeding, are outlined, with comments on temporary pastures, kinds of pastures in Nebraska, and factors to be considered in planning a pasture program. The descriptions of common pasture plants include nine introduced grasses, seven native grasses, and six legumes.

Yields of barley varieties in the United States and Canada, 1932-36, G. A. WIEBE, P. R. COWAN, and L. REINBACH-WELCH (*U. S. Dept. Agr., Tech. Bul. 735 (1940), pp. 78*).—The yields of barley obtained on the testing fields of the United States and Canada during the period 1932-36 are reported as heretofore (E. S. R., 73, p. 467), and outstanding varieties grown are tabulated and discussed by stations and also in a summary table. As far as possible, local recommendations have been included as to varieties and rates and dates of seeding. Alphabetical indexes of stations and varieties are appended. Trebi produced the highest average yield at 32 stations, Wisconsin Barbless (Pedigree 38) at 10, and White Smyrna at 4. Leading varieties in second place were Trebi at 13 stations, Hannchen at 10, O. A. C. 21 at 5, Vaughn and Spartan at 4, and Wisconsin Barbless at 3. The newer sorts showing promise consisted largely of hybrids and selections developed by plant breeders.

Illinois corn performance tests, 1940, R. R. COPPER, G. H. DUNGAN, A. L. LANG, J. H. BIGGER, B. KOEHLER, and O. BOLIN. (Coop. U. S. D. A. and State Nat. Hist. Survey). (*Illinois Sta. Bul. 474 (1941), pp. 173-223, figs. 3*).—The yield of corn on the 12 fields in the 1940 tests (E. S. R., 82, p. 765), including 386 hybrids and 26 open-pollinated varieties, averaged 72.1 bu. per acre, 28.1 bu. above the average for the State. During the 7 yr. (1934-40) of these tests, average yields on the test fields exceeded the average State yields by 111, 94, 79, 64, 47, 53, and 64 percent, respectively. The 5 best hybrids on all 12 fields averaged 27.4 bu. of sound corn per acre above the 5 open-pollinated varieties and also had 13.4 more erect plants per 100, and again surpassed the open-pollinated corns in yield of sound corn and in percentage of erect plants on every test field. Except on one field, the 5 poorest hybrids averaged more bushels of sound corn than the open-pollinated varieties. Compared with the open-pollinated corns, the hybrid entries, on the average, improved through the years of the tests in yield of sound corn but not in lodging resistance. Data from two fields indicated that after an early killing frost most hybrids dry out faster than the open-pollinated varieties.

No advance toward better ear rot resistance appeared to have been made in most hybrids currently in general commercial production. Diplodia ear rot caused much damage on the Kings and Round Lake fields. *Fusarium* ear rot was prevalent throughout the State, and smut caused more damage than usual.

In soil-adaptation tests at Sibley and Urbana, hybrids grown on good soil and under good soil management responded better than the open-pollinated variety to such conditions. At Urbana the five best hybrids yielded 23.3 bu. more per acre on the high-fertility area than on the poorer fields, while the open-pollinated variety yielded 0.5 bu. less on the better field than on the poorer one. Hybrids

normally ranking high on poor soils ranked high in all soil-adaptation tests in 1940, and hybrids normally high on good soils ranked low in all tests.

The 1940 Iowa corn yield test, M. S. ZUBER and J. L. ROBINSON. (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul. P19, n. ser. (1941), pp. 517-593, fig. 1*).—The 482 entries comprising 1,446 district entries in the 12 fields of the 1940 Iowa corn yield test were grown cooperatively in the same groupings as in previous years (E. S. R., 83, p. 51). In addition to yields, scores, stand, moisture content, lodging, ear height, ears dropped, and damaged seed for each entry, information is included on results over several years, test conditions and methods, and the season. The average yield of all hybrids was greater than that of open-pollinated varieties in each section and in six districts, and the average advantage of hybrids for the entire State was 20 percent. All hybrids in the test did not excel, however, for in two districts the lowest yield was made by experimental hybrids and in two others by regular hybrids. The hybrids had a marked advantage over open-pollinated varieties in lodging resistance.

Section entries with highest performance scores in regular hybrid and experimental hybrid classes, respectively, were for the northern section Iowa Hybrid 939, C 17; north-central section U. S. Hybrid 35, Hawkeye M14; south-central section Ioway Supercorn 218-H, Iowa Hybrid 8110; and for the southern section C 21, McCurdy 124M. The grower of Iowa Hybrid 939, because of performance in the northern section, was again awarded a trophy for the regular section entry having the highest performance score.

Kansas corn tests, 1940, R. W. JUGENHEIMER, A. L. CLAPP, and H. D. HOLLEMBEEK. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 292 (1941), pp. 47, figs. 2*).—The behavior of corn hybrids and varieties in the district, experiment station, and cooperative corn strip tests of the Kansas corn testing program (E. S. R., 83, p. 51) in yield and different agronomic characters is reported in detail and in summary form. Hybrids yielding above the average of all entries in eight fields in eastern Kansas included U. S. 35, Mo. 47, Ill. 200, U. S. 13, Funk G-94, Pioneer 332, DeKalb Exp. 94, Pioneer 307, Kans. 1466, Pioneer 380, and Kans. 1501. Hays Golden ranked fifteenth and Pride of Saline twenty-second, and their yields were below the average of all entries. Two-yr. averages, 1939 and 1940, on from 21 to 25 entries were obtained in only three districts and showed that the hybrids ranking first and second in yield were in district 1, Funk G-94 and U. S. 35; district 2, Jewett 11 and Kans. 2015; and district 5, Kans. 1296 and U. S. 35. In 2-yr. results available on 10 entries compared in all three districts, U. S. 35, U. S. 13, Mo. 47, Pioneer 307, and U. S. 44 were outstanding in performance. Jewett 11, said to be productive but to lodge badly, ranked high in cooperative strip tests in eastern Kansas, and National 134, Mo. 47, U. S. 13, U. S. 35, Pioneer 332, and Funk G-94 also made high yields. Limited evidence suggested that more satisfactory results usually would be obtained if the corn acreage was planted to three or four different tested hybrids varying in maturity instead of only one. Time of planting should be spread over several weeks or a month. Many promising inbred lines and hybrids have been developed by the Kansas hybrid corn breeding program, and certain hybrids appeared to be superior to varieties and hybrids currently available for farm planting.

Effect of date of planting on corn yields, insect infestation, and fungous diseases, D. M. JOHNS and H. B. BROWN (*Louisiana Sta. Bul. 327 (1941), pp. 28, figs. 8*).—An experiment on Mississippi alluvial soil at Baton Rouge, 1933-37, to determine the effect of the date of planting on corn yields, infestation of certain insects, and diseases comprised nine plantings made each year at about 15-day intervals from February 25 to July 3. Yield differences were probably not

significant in plantings from February 25 to May 15, but plantings in June and July consistently produced lower yields. Rapidity of growth and development was greater in the later plantings excepting that at July 3.

High infestation of southern corn rootworm occurred only in February and March plantings. The corn earworm was less plentiful in March and April 12 plantings, and the ears apparently were injured to a lesser extent. The plants infested with the cane borer numbered about the same in February, March, and April 12 plantings and increased in each planting thereafter, the infestation approximating 100 percent in the later plantings. With each 15-day delay in planting, the percentage of ears infested with cane borers increased 4.24 percent, with a range of from 10.9 to 44.8 percent. A higher percentage of ears infested with weevils and more weevils per infested ear were found in the earliest and latest plantings.

Physotherma, or brown spot, disease was severest in the May 15 planting, but the differences among the earlier plantings were small. June and July plantings were affected only slightly. February and March plantings were least infested with *Diplodia* dry rot, and smut infection was lowest in early spring plantings. The rust disease (*Puccinia sorghi*) caused serious injury to the June 15 and July 3 plantings each year, and during some years to the June 1 plantings.

A roguing service for producers of foundation seed potatoes (*Maine Sta. Misc. Pub. 559 (1940), pp. [14]*).—Rules and regulations under which the station will place its seal of approval on foundation seed stocks, for use in Maine only, deal with isolation requirements, care of land, planting, seed and its preparation, spraying, roguing, early harvesting, storage, disposal of seed stock, Florida test sample, disease tolerance, and other provisions.

Ramie fiber production, B. B. ROBINSON (*U. S. Dept. Agr. Cir. 585 (1940), pp. 15, figs. 4*).—This publication is a revision of and supersedes Miscellaneous Circular 110 (*E. S. R., 61, p. 729*).

Range of adaptation of certain varieties of vegetable-type soybeans, J. W. LLOYD (*Illinois Sta. Bul. 471 (1940), pp. 77-100, figs. 4*).—The reports from 810 persons to whom samples of vegetable-type soybean (*E. S. R., 81, p. 369*) seed were sent in the spring of 1939 indicate a wide range of adaptation and successful production from Maine to the Pacific coast and from near sea level to an altitude of 8,400 ft. Early varieties proved to be best producers in most localities and were the only ones well adapted to northern regions. Dry weather interfered with the proper development of the crop in some places, although many reports indicate the ability of the vegetable-type soybean to withstand extreme drought. Rabbits were the most prevalent enemy of the crop, although grasshoppers were serious in certain localities. About 70 percent of the co-operators reporting success in producing the crop were well pleased with its table quality.

Soybeans in New Hampshire, F. S. PRINCE, L. J. HIGGINS, P. T. BLOOD, and G. P. PERCIVAL (*New Hampshire Sta. Cir. 57 (1941), pp. 16*).—Cultural, lime, and fertilizer trials and tests of varieties suitable for both forage and seed are reported, with remarks on the possibilities for producing soybeans in the State. Soybeans for hay, silage, green feed, and pasture are being produced in considerable quantity in New Hampshire, but few soybeans are being grown for seed. Under present economic conditions, seed production may not find favor, except perhaps on dairy farms where threshing equipment is available and the beans can be used as a concentrated feed.

Mixtures of soybeans and Hungarian millet for hay, a practice of farmers, in two tests ranged from 24 to 62 percent higher in yield than the same soybean grown alone. Definite growth responses followed additions of lime up to 1 ton

per acre on moderately acid soils, while on a field at pH 4.7, poorly buffered, 2 tons produced better yields than 1 ton, and magnesium limestone surpassed calcium limestone in stimulating soybean growth. Although varying results were obtained in fertilizer tests, depending largely upon fertility of the test soil, the results suggested that good forage yields can be produced with moderate application of manure and superphosphate but that a complete fertilizer should be used if manure is not available. The soybeans appeared less responsive than other legumes to fertilizer variations and not so exacting as alfalfa to high fertility levels.

A leader in forage production was the Dunfield variety, followed closely by Mukden, Black Eyebrow, and Manchu, and then Harbinsoy. Pekwa and Wilson, excellent hay varieties because of fineness of stem, have not usually ranked among the first five. Tests of soybeans adapted to seed production in New Hampshire, 1938-40, indicated that many strains will mature seed near Durham. Yields of 25 varieties averaged from 21 to 32 bu. per acre over the period.

Neither lime nor fertilizer had more than a slight influence on the protein content of soybean forage. Soybeans grown in cultivated rows had a much higher protein content than those broadcast.

Wheat varieties of importance in N. Dak., T. E. STOA, R. H. HARRIS, and L. D. SIBERTT. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 3, pp. 3-8).—It is concluded that "of the varieties now available, Thatcher may be considered as being the variety most preferred. . . . Minudum is usually the first choice among the durum growers."

Oklahoma wheat improvement, 1939-40, H. S. SMITH (*Oklahoma Sta. Cir.* 91 (1941), pp. 16, figs. 3).—Analyses of 1,221 farmers' samples showed that Tenmarq (20.7 percent), Turkey (17.5), Blackhull (17.4), Early Blackhull (8.8), and Chiefkan (7.9 percent) constitute over 72 percent of the wheat grown in Oklahoma. The percentages of varieties grown in different counties are tabulated. When hard red winter wheat samples exhibited by farmers at county fairs were tested by commercial milling and baking laboratories, the average score of Tenmarq was 95.2, Turkey 93.1, Blackhull 90.1, and Chiefkan 84.5. Chiefkan was inferior in flour color, dough properties, volume of loaf, crumb color, grain, and texture. The cars of wheat delivered to three terminals in Oklahoma, 1940, according to inspectors' certificates, were 9.2 percent of mixed wheat (hard and soft red winter types), 8.5 percent graded down on rye mixtures, and 0.6 percent smutty cars. See also an earlier note (E. S. R., 82, p. 40).

HORTICULTURE

[**Horticultural studies by the Delaware Station**] (*Delaware Sta. Bul.* 227 (1940), pp. 30-34).—Among studies, by L. R. Detjen, W. H. Phillips, and E. W. Greve, the progress of which is discussed are the nature and effect of curculio injury on the dropping of immature fruits, self-fruitfulness of peach varieties, production of cabbage seed, effect of exposing harvested apples to sunlight as a means of improving color, time of applying cyanamide to peach trees, a comparison of seedling-rooted v. own-rooted apple trees, relation of magnesium deficiency to peach tree growth, rootstocks for the apple, and the plant food requirements of strawberries.

[**Horticultural studies by the Kansas Station**] (*Kansas Sta. Bien. Rept.* 1939-40, pp. 41-42, 63-69, 136-137, 140).—Included are reports on studies by R. I. Throckmorton, W. F. Pickett, L. E. Melchers, G. A. Dean, E. Abmeyer, R. J. Barnett, G. A. Filing, S. W. Decker, L. R. Quinlan, E. P. Eshbaugh, and E. H. Coles in soil management in an Atchison apple orchard; pruning of the Winesap

apple; spraying of apple trees; spraying of newly planted nursery trees with wax emulsions; pruning of sour cherry trees; testing of fruit varieties; effect of ground cover on frost penetration in orchard soils; culture of the strawberry; training of bramble fruits; winter protection for red raspberries; freezing preservation of small fruits; variety tests of vegetables; use of cloth houses for flowers and vegetables; irrigation of farm gardens; relation of leaf structure to rate of photosynthesis of York, Jonathan, and Wealthy apples; effect of drought on trees; production of sour cherries at the Fort Hays Substation; and the testing of fruit varieties at the Colby Substation.

[Horticultural studies by the South Carolina Station] (*South Carolina Sta. Rpt. 1940*, pp. 68-70, 156-166, 168-174, 178-181, 183-184, figs. 7).—Among studies the progress of which is discussed in considerable detail are the following by J. H. Mitchell, E. J. Lease, D. B. Roderick, J. B. Edmond, L. E. Scott, W. C. Barnes, J. M. Jenkins, Jr., O. B. Garrison, and C. J. Nusbaum on the comparative mineral composition of turnip greens grown under different environmental conditions at the main station; boron deficiency in grapes and soil moisture relations in peach orchards at the Sandhill Substation; variety testing and breeding of lettuce, fertilization of lettuce, fertilization of cabbage, and the testing of sweet corn varieties at the Truck Substation; and cantaloup variety testing, hill spacing, and breeding at the Edisto Substation.

[Horticultural studies by the Wyoming Station] (*Wyoming Sta. Rpt. 1940*, pp. 36-37, 38).—At Lander, studies were conducted on the relation of soil management and fertilization to control of chlorosis in apple trees and the growing and distribution of shelterbelt trees was actively pursued. At Lyman, the growing of green peas for seed production and for canning use was investigated.

[Horticultural studies by the Wyoming State experiment farms] (*Wyoming Sta. Bul. 243 (1941)*, pp. 18-19, 19-21, 24, 39-40, fig. 1).—Included are brief progress reports on studies of the value of irrigation water for the farm garden, the fertilization of apple trees, the breeding of apples and garden beans, and garden peas as a cash crop.

The rapid detection of soil moisture, R. H. WHITE-STEVENS and W. C. JACOB. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 261-266, figs. 3).—This paper deals with two methods, the first designed to effect the rapid estimation of soil moisture in laboratory samples and the second to make continuous measurements of soil moisture in situ without disturbing the surrounding root soil relations during or between measurements.

The effect of manures on plant growth on Wichita Valley soils, B. PICKERT. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 345-348).—Using two soils, Yahola very fine sandy loam and Miller silty clay loam, pot experiments were conducted with different alfalfa or barnyard manure additions. Radishes were used as the crop because of their rapid development. Alfalfa, as a green manure, proved a satisfactory medium for adding organic matter to both soils, but there was evidence that too large alfalfa applications, above 64 tons per acre, might reduce yields. On the heavy Miller soil barnyard manure proved a satisfactory source of organic matter. Field observations on other crops confirmed the results of the pot experiments.

Partial elimination of experimental error from data by the use of significance tests, E. M. EMMERT. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 272-278).—This paper discusses the use of a new technic designed for interpreting more accurately the results of studies with crop plants and deals specifically with the data from a tomato fertilizer study at the Western Kentucky Substation.

The effect of environment upon the variability within a population of plants, R. H. ROBERTS and B. E. STRUCKMEYER. (Univ. Wis.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 267-268, figs. 2).—Seedlings of a strain of Chinese cabbage grown under different temperature and photoperiod conditions were so different in variability as to lead the authors to question whether a population of plants which appears uniform is genetically uniform or is uniform simply because of the environmental influence.

[Vegetable crop studies by the California Station]. (Partly coop. U. S. D. A.). (*California Sta. [Blen.] Rpt. 1939-40*, pp. 99-100, 115-117).—Progress reports are presented on studies of varieties and culture of asparagus; the development of the Essar tomato; and the breeding of spotted-wilt-resistant tomatoes, mildew-resistant cantaloups, wilt-resistant watermelons, and powdery-mildew-resistant Persian melons.

1939 vegetable variety trials and list of recommended varieties, I. M. BURGESS and R. M. BAILEY (*Maine Sta. Misc. Pub. 560* (1940), pp. [2]+29, figs. 3).—Based on the results of trials in different locations in the State, information is presented on the performance and characters of varieties of several different species.

Residual effects of forcing and hardening of tomato, cabbage, and cauliflower plants, M. F. BABB (*U. S. Dept. Agr., Tech. Bul. 760* (1940), pp. 35, figs. 5).—Comparisons were made of the residual effects of forcing and hardening treatments on tomato, cabbage, and cauliflower seedlings. Forcing was accomplished by growing seedlings continuously under optimal conditions of light, temperature, and moisture until they were set in the field. Hardening consisted of growing the seedlings for a time in the greenhouse and then removing them to coldframes where they were subjected to gradually lowered temperatures and water supply. The effects on forced and hardened plants of N, P, and K separately and combined as a complete nutrient solution were also investigated.

The first year's work showed no significant differences between forced and hardened tomato plants in number or weight of ripe fruit in either early or total production. Both N and the complete nutrient solution reduced early yields, but none of the fertilizers affected total yields. In the second year's test the forced plants produced a greater number, though not a greater weight, of early fruit but the hardened plants led in total production. Fertilizers were without effect on earliness or yields. Similar treatments on cabbage showed greatest early yields in number and weight of heads from forced plants treated with N or a complete nutrient solution. P increased earliness of maturity at the expense of weight. For the entire season there were no significant differences between the forced and hardened plants in number or weight of heads produced. The first test of cauliflower showed early gains of 26.03 percent in number of heads, but differences in total weights were not significant nor did fertilizers produce significant differences. In the second year's test forced plants showed a gain of 35.12 percent in number of heads for the early period and 12.96 percent for the season. Differences in weight for the early period were not significant and the hardened plants produced the greater total weight. P, K, and the complete nutrient solution increased yields over N, but only K increased them over the unfertilized checks and the latter exceeded those given N in total number. The effects of fertilizers on weight were similar to their effects on number.

Also reported are the differential effects of fertilizers on yields and on certain morphological characters of forced and hardened plants when applied during various stages in their life cycles, the relationship of root growth and

transpiration to subsequent performance, and the effects of the treatments and fertilizers on chemical composition and subsequent performance of the plants.

Comparative studies of varietal suitability for freezing preservation of peas, green or snap beans, lima beans, and sweet corn grown under eastern conditions. J. S. CALDWELL, J. M. LUTZ, H. H. MOON, and C. W. CULPEPPER (*U. S. Dept. Agr., Tech. Bul. 731 (1940), pp. 72*).—During 1934 and 1935 there were grown under uniform cultural conditions at Arlington, Va., 18 varieties of peas, 14 of green beans, 8 of lima beans, and 35 of sweet corn as material for freezing storage studies. With the exception of sweet corn, each group of varieties showed a rather wide range in appearance and table quality after identical preparatory and freezing treatment. Among the green beans, Giant Stringless Green Pod, Mosaic-Resistant Stringless Green Refugee, and Kentucky Wonder Pole were distinctly superior in color and appearance and in cooking quality following freezing. In peas, Thomas Laxton and Asgrow No. 40 were found superior, although a second group consisting of Dark Poddled Telephone, Onward, Alderman, and Laxton Superb were about as good. Of the lima beans, the King of the Garden and Giant Poddled pole varieties and Dreer Bush were superior. Fordhook beans in the smaller sizes were equal to the first three. Of the 35 sweet corns, 10 were rated as of highest quality and 13 others were classified as very good to excellent. Among the 10 best varieties were Golden Bantam, Top Cross Bantam, Top Cross Whipple Yellow, Narrow Grain Evergreen, and Stowell Evergreen.

By picking vegetables at different stages of development, information was obtained on the effect of maturity on the quality of the frozen product and the cooked preparations. Comparisons of parallel packs with and without brine showed somewhat better preservation in the brine packs of peas, lima beans, and corn when examined in the frozen state. Upon cooking such differences disappeared. In all four vegetables the differences in appearance of material preserved in hermetically sealed and nonsealed containers were very slight, and there were no differences in preservation of flavor and quality over the usual storage periods.

The Imperial strains of lettuce. I. C. JAGGER, T. W. WHITAKER, J. J. USELMAN, and W. M. OWEN (*U. S. Dept. Agr. Cir. 596 (1941), pp. 16, figs. 11*).—In response to an ever-increasing demand on the part of plant breeders, growers, seedsmen, and others, information is presented regarding the origin and development of the Imperial strains of lettuce and descriptions of the parental stocks and of the resulting improved strains, with tabulated data as to their distinctive characteristics and regional adaptation.

Refractive index as an estimate of quality between and within muskmelon fruits. T. M. CURRENCE and R. E. LARSON. (Univ. Minn.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 820).—Studies of the relation between refractometer readings as recorded with a Zeiss hand instrument and quality ratings as determined by a number of people indicated that melons differ significantly in quality and that testers differ significantly in estimating quality. Regression data of quality means on refractometer readings indicated a highly significant correlation coefficient of 0.636, the regression of quality score on percentage dry substance being 0.167. The correlation coefficient between quality means and refractometer readings was 0.862, a highly significant figure. The hand refractometer is believed to possess decided possibilities in simplifying quality tests on muskmelons.

The growth and composition of the fruit of okra in relation to its eating quality. C. W. CULPEPPER and H. H. MOON (*U. S. Dept. Agr. Cir. 595 (1941), pp. 18, figs. 6*).—The changes in composition, rate of growth, and eating quality

of the fruit of field-grown okra of the variety Perkins Improved were studied during growth and maturity. The fresh weight of the fruit increased slowly for a few days after flowering, then rapidly for a time, after which the rate of increase declined to zero as the fruit attained its maximum weight. Later the fresh weight decreased as a result of drying. Only small changes occurred in the sugar, acid, astringency, and soluble solids content during the growth of the fruit. The insoluble solids and the total solids decreased to about the 14-day stage of maturity and then increased to full maturity. Temperature variations affected greatly the rate of growth, and the rate more than doubled for each rise of 18° F. within the temperature range of 47.5° to 82.5°. Differences in the texture were more important than differences in the sugar, acid, and astringency in determining eating quality. The fruit improved in quality for a short time after flowering, then declined until shortly before growth in length ceased, at which time it became unsuitable for table use.

Observations on the composition of different parts of the okra fruit showed the wall and placental regions to be lower in total solids than the seeds, with no great difference between wall and placental tissues. In the wall and placental tissues sugar content decreased and insoluble and total solids increased with the age of the pod.

Onion fertilizer experiments at Laredo, Big Wells, and Eagle Pass, Texas, L. R. HAWTHORN (*Texas Sta. Bul. 596 (1941), pp. 20*).—Extending earlier studies (E. S. R., 75 p. 341) to include other soil types, the author found that the response of onions to fertilizer was, in general, not nearly so marked on Laredo silt loam and Monteola clay as it was on Webb fine sandy loam. There was no consistent response on Laredo very fine sandy loam attributable to a deficiency in available N or to an unsatisfactory nutrient balance caused by a lack of N. In no case was the response to K statistically significant. Side dressings of sodium nitrate tended to increase yields on all three soils, especially on the Laredo very fine sandy loam at Eagle Pass. On Monteola clay the increase from sodium nitrate side dressings was practically negligible. Fertilizers with 1-3-0 or 1-3-1 ratios were no more effective than those with 1-2-0 or 1-2-1 ratios in increasing yields. K again had little or no effect on the keeping quality of onions.

Varieties of English peas, methods of planting, sticking, and fertilization reported by the Truck Crops Branch Station, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 11, p. 8*).—Information is presented on varieties, methods of planting, and fertilizers. The highest yields from the first two pickings in 1940 were obtained from Glacier, World Record (Rice Strain), 301, and Dark Podded Thomas Laxton. Among the highest yielders in 1940 were World Record (Rice Strain), Gradus, and Thomas Laxton. The indications were that the most profitable quantity of fertilizer is about 1,000 lb. per acre of a 4-8-4 mixture. Of various formulas, the 4-8-4 appeared to be the most desirable from the standpoint of economical returns.

Uptake of nutrients by the Perfection pimiento plant under field conditions and its relation to fertilizer practices in Georgia, H. L. COCHRAN and L. C. OLSON (*Georgia Sta. Bul. 208 (1941), pp. 16, figs. 4*).—Using an improved strain of Perfection pimiento planted on (ecl) sandy loam and fertilized with 600 lb. per acre of an 8-8-6 mixture applied in the row before setting, the authors collected plants for analysis and dry weight determinations at monthly intervals during the growing seasons of 1939 and 1940. The total dry weight of plants increased from month to month during the growing season, the maximum increase occurring in July, the third month after setting in the field. Beginning in August, the monthly increment became progressively smaller.

From the results of the analyses it was evident that the Perfection variety has a fairly large N, P, K, Ca, and Mg requirement. An average of 243 lb. of nutrients was found in the above-ground portion of an acre of plants. Of this total, 82, 56, 51.5, 36.5, and 17 lb. were, respectively, N, K, CaO, MgO, and H_2PO_4 . The greatest quantity of nutrients absorbed was taken up during the third month. Of the five nutrients, more K was absorbed during any single month than any one other nutrient, followed in order by N, Ca, Mg, and P. In view of the greatest utilization of nutrients during the third month, it is suggested that part of the N and K be applied as a side dressing during the growing period.

"Bounty" tomato.—Preliminary report and description, H. MATTSO (North Dakota Sta. Bimo. Bul., 3 (1941), No. 3, pp. 11-14, fig. 1).—Information is presented on the parentage, plant and fruit characters, yield, and grade of fruit, together with a note on the results of tests in other localities.

[Pomological studies by the California Station] (California Sta. [Blen.] Rpt. 1939-40, pp. 64-68, 71-73, 82-84, 117-124, 126-127, 144-146, 146-147).—Among studies discussed are the N requirements of citrus trees; P deficiency symptoms in citrus; causes of lemon-tree decline; soil deficiencies and their symptoms in citrus; Mn requirements of walnuts; N fertilization of walnuts; factors affecting the fruiting behavior of the Fuerte avocado; fruit thinning of the loquat; rootstocks for the persimmon; effect of bleeding on the grapevine; effect of seasonal heat on the ripening of the Tokay grape; causes of poor growth of replanted peach orchards; effect of hormones on the delayed foliation of deciduous fruits; drying ratio and size of prunes; fertilization of deciduous fruits; breeding of grapes, peaches, apricots, and tangelos; rootstocks for citrus and effect of rootstocks on citrus quality; rootstocks for grapes; development of standards for measuring the maturity of Bartlett pears; the waxing of deciduous fruits; and the storage of citrus fruits.

Home orchards in Mississippi, T. E. ASHLEY (Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 11, pp. 3-6, figs. 9).—General information is presented on planning, planting, varieties, pruning and training, cultural treatments, fruit thinning, insect and disease control, etc.

A fruit circumeter, O. M. MORRIS. (Wash. State Col.) (Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 191-192, fig. 1).—Stating that studies of fruit growth fail occasionally to supply definite information, the author describes a measuring device, a circumeter, that has been found satisfactory in the measurement of apple, pear, and peach fruits.

Ten years of operation cost records on stationary spray equipment, C. L. BURKHOLDER, T. E. HENTON, and M. REED. (Ind. Expt. Sta. et al.). (Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 401-403).—Notable savings in cost of applying 100 gal. of spray in favor of stationary over portable outfits were recorded at the station farm at Bedford, Ind. Data taken in a commercial orchard at Vincennes showed also that stationary plants are economical. The cost of spray applications is said to vary with such factors as size of trees, planting distance, and contour of the orchard. The savings in the Vincennes orchard were sufficient to have paid for the entire original cost of the stationary plant in something less than 5 yr.

The effect of lime and weathering upon lead arsenate and copper spray mixtures, A. L. WEBER and H. C. MCLEAN. (N. J. Expt. Stas.). (Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 391-396).—Lead arsenate had a definite effect on the water solubility of the copper in various commercial copper fungicides and home-made bordeaux mixtures. As a rule the copper compounds had a tendency to decrease the solubility of the arsenic. Lime caused a decrease in the solubility of the water-soluble arsenic and in most of the fungicides, including bordeaux

mixture, tended to increase the soluble copper. In low-lime bordeaux, the lead arsenate caused a great increase in the water-soluble copper. When a film of spray mixture was exposed to the air for 2 weeks, the presence of lime caused a large increase in water-soluble arsenic, and water-soluble copper increased in all cases except in one fungicide where no lime was present. Comparing apple leaves covered with cellophane with exposed leaves, it was found that the latter had a higher ratio of lead to arsenate. Apparently, in the open, rain washed off As_2O_3 at a greater rate than it did the lead. No correlation could be established between the burning of apple leaves and lead to arsenic ratios.

The effect of growth and weathering upon spray residue, H. C. McLEAN and A. L. WEBER. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 397-400).—To determine whether the harvest lead load on apples may be predicted by lead analysis of the fruits following spraying, samples of 50 fruits each collected from 6 grower orchards immediately following the last cover spray were analyzed. Although the results indicated that the lead load would be below the required tolerance, determinations of lead on the harvested fruits showed such not to be the case. Apparently the lead load per apple had definitely increased due to weathering and redeposit. The need of analysis at the time of harvest was shown.

The effect of nitrogen and phosphorus on the growth of apple and peach trees in sand culture, C. S. WALTMAN (*Kentucky Sta. Bul.* 410 (1940), pp. 157-549, figs. 13).—With a view to observing symptoms resulting from deficiencies or excess of N or P, 14 1-year-old trees of Staymared and Paducah apples and 14 of Elberta peach were, after removal of all fibrous roots and top pruning, placed in culture jars containing washed sand and supplied with seven different nutrient solutions varying in N and P contents. Where N was omitted from the nutrient solution, growth was seriously affected, particularly in the peach. The two apples differed in their response to N, and in all cases except the basal solution treatment Paducah made the greater growth. Percentage gains in weight of trees indicated that the peach is more sensitive to a lack of P than is the apple but does not respond as well to high P. P deficiency in both peach and apple was manifested in characteristically long and narrow dark-green leaves, changing to dark yellowish-green or bronze in the late season. A lack of P affected root growth seriously, particularly the fibrous roots. Analyses of new growth in late summer showed that the omission of either N or P from the solution resulted in a marked reduction of that particular element in the tissues.

The nutrient solutions, adjusted to approximately pH 4.2 before adding to the culture jars, were changed to a decidedly less acid condition, about pH 7.0, when first added to the sand. As the season progressed and the treatments continued, the nutrient solutions which had been in the sand and in contact with the roots became more acid. The decidedly acid reaction found during the last weeks in all solutions which contained N is attributed to a combination of factors, such as the continued excretion of certain materials of CO_2 from the roots, the probable hydrolysis of the ammonium nitrate salt, and the greater assimilation of NH_3 than of NO_3 by the roots, and finally a continued lowering in the absorptive capacity of the sand.

The effect of water supply on the rate of photosynthesis, transpiration, and respiration of apple leaves, N. F. CHILDERS and G. W. SCHNEIDER. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 365).—Observations on small apple trees growing in a controlled environment chamber where the light was kept constant at about 4,000 footcandles and the temperature at

levels of 80°, 90°, and 100° F. indicated that the drying of the soil had an appreciable effect on the rate of CO₂ assimilation by apple leaves before the soil reached the wilting point. This effect was especially evident at the higher temperatures. The less severe and the shorter the drought period, the quicker the rate of photosynthesis, transpiration, and respiration return to their usual relationship with the watered plant. The first reduction in photosynthesis appeared sooner at the higher temperatures. There was a marked decrease in CO₂ assimilation before the soil moisture reached the wilting coefficient. Although dry plants regained turgidity within a few hours, they did not recover in photosynthesis before from 2 to 7 days. Transpiration recovered at the same time as photosynthesis or slightly earlier.

The low-temperature hazard to set of fruit in the apple, M. J. DORSEY (*Illinois Sta. Bul. 473 (1940), pp. 145-170, figs. 5*).—Following two freezes in April 1930, the second occurring when the most advanced flowers were about to open, not a single flower was found in which the outer cell layers of the stem, receptacle, and calyx lobes had not separated from the underlying tissues. However, there was a heavy crop of fruit. The separation of tissues was noted again in April 1933 following freezes. To check the phenomenon and establish the temperature levels at which such injury occurs, buds and immature fruits were examined after submission to known low temperatures in cold-storage chambers. The results indicated that the tissues of young fruits are broken by ice masses at approximately 28° F., but that the ovules are not materially damaged at this temperature. In buds collected in the orchard after a November freeze, ruptures were observed in the flower and leaf rudiments. Active mending of the breaks did not occur until late in March, leading to the conclusion that the failure to mend during the dormant season may be an adaptation to fluctuating temperatures. Apparently, the break in tissues caused by freezing is a result of cleavage between cells rather than a rupture of the cell walls. The author describes the mending process and states that under favorable conditions of growth in early spring mending of the tissues is relatively rapid and may be completed within a period of from 2 to 3 weeks. Only when the temperature is low enough to kill all the ovules need the set of fruit be greatly reduced. Various types of russetting may result if the mending process is interrupted and such markings may easily be confused with spray burn. Favorable growth vigor in the tree is an important factor in recovering from the type of separation injury recorded.

The effect of the stocks on seven years' growth of four apple varieties, G. E. YERKES and R. H. STODDS. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 294-297*).—A study of the growth data obtained on 7-year-old Gallia Beauty, Staymared, Starking, and York Imperial trees, budded on seedlings and on clonal rootstocks, showed that York Imperial was more sensitive to stock influences than the other varieties. Gallia Beauty was next in order. Trees on clonal stocks were a little more uniform than those on seedlings if the classes were compared as a whole, but the difference was of doubtful statistical significance. Particularly in the case of trees on seedlings of Northern Spy, Grimes Golden, and Wealthy were there individuals much below the average in size for their group. If maximum growth is desired, Jonathan, Rome Beauty, and McIntosh were better sources of seedling stock than the above-mentioned three varieties. Abnormally small trees occurred also on clonal stocks, but more infrequently. Jonathan seedlings were uniformly good for all four varieties.

The relation of firmness to ripeness of eastern-grown apples, M. H. HALLER, J. M. LUTZ, and E. D. MALLISON (*U. S. Dept. Agr. Cir. 579 (1941), pp.*

21, figs. 17).—In order to establish a more accurate index of ripeness, pressure-test determinations were made and the ripeness estimated on one to three pickings of 16 commercially important varieties of apples during storage at 32°, 36°, and 70° F. for three seasons. Regardless of season, picking maturity, or temperature of ripening, each stage of ripeness was generally represented by a fairly definite range of firmness for each variety. The pressure tester was found to be a valuable supplementary method to determine more accurately the stage of ripeness, and the pressure-test range for each stage of ripeness is shown for each of the varieties under test.

Effect of carbon dioxide treatment upon the rate of ripening in apples, C. BROOKS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 463-466, figs. 3).—Studies with Jonathan, Starking, and Stayman Winesap apples placed in storage the day following picking showed that the use of carbon dioxide before refrigeration may serve as a valuable supplement in slowing down the rate of ripening. An exposure for 2 days to 40 percent CO₂ at temperatures above 50° F. resulted in a much greater delay in ripening than holding at 32° for 2 days without CO₂. With CO₂ treatment there occurred a rapid building up of CO₂ within the fruit and consequent slowing down of metabolic activity.

Storage of Delicious apples in artificial atmospheres, D. V. FISHER (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 459-462).—In studies at the Iowa State College in which Delicious apples were stored in three artificial atmospheres and in air at 32° and 40° F. it was found that an increment in carbon dioxide did not help to control mealiness although it did improve the flavor of fruit over that stored in air at the same temperature. Apples stored in artificial atmospheres at 40° became mealy more rapidly than those in air at 32°. An atmosphere of 97.5 percent N₂ and 2.5 percent O₂ resulted in fruit of the best storage quality at both 40° and 32° and delayed the onset of mealiness.

Evaluation of variety peach seedling stocks with respect to "wet feet" tolerance, P. C. MARTZ and F. E. GARDNER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 335-337).—Stating that peach roots are very susceptible to the type of injury known as wet feet, the authors present the results of trials in which 1-year-old peach seedlings planted in 3-gal. crocks were flooded with water for 2-4 days and then drained. Usually by the end of the fourth flooding most all of the seedlings showed severe injury. The degree of injury was greatly influenced by temperature and sunshine during the flooding period. The seedlings from the 74 varieties tested were grouped into four lots with respect to wet feet tolerance. In group 1 (relatively excellent) were Brackett, Gaume, Hauss, Late Elberta, Lemon Cling, Linworth, and Shalil. In group 4 (relatively poor) were Augbert, Banner, Captain Ede, Carman, Chili, Krummel, Lemon Free, Martha Fern, Mountain Rose, and Muir. The so-called Carolina or Tennessee "naturals" commonly used by eastern nurserymen were in group 3 (relatively fair).

Some results of crosses of early ripening varieties of peaches, M. A. BLAKE. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 232-241, figs. 3).—Faced with the difficulty of obtaining viable seed in crosses of early-ripening peaches, the station employed a technic of growing seedlings in culture jars containing sand, sugar, and a nutrient solution. The use of this technic made possible the production of seedlings from early-maturing parents and the attainment of fruiting age in considerably less time than by the usual procedure. The progeny of Raritan Rose × Duke of York were especially vigorous and prolific. The progeny of Raritan Rose × Greensboro showed

the most prolific bud set, with 68 percent of the trees having 20 or more buds per foot. A total of 55 percent of the progeny of Raritan Rose \times Mayflower ripened from July 1 to July 20. Fifty-one percent of the progeny of Raritan Rose \times Duke of York ripened earlier than either parent. Raritan Rose \times Duke of York gave 58 percent of seedlings with well-colored fruits. The white-fleshed Pioneer, Raritan Rose, Rosebud, and Cumberland varieties were heterozygous for white flesh color. Discussing the importance of a low content of catechol tannin in the fruit, the author states that the progeny of Raritan Rose \times Duke of York had 49 percent of the seedlings in the low tannin class. The seedlings of this cross came into fruiting early, developed a good set of fruit buds, and bore fertile flowers.

Peach variety resistance to cold injury at blossom time, D. H. SCOTT and F. P. CULLINAN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 209-214, fig. 1).—Observations on some 150 varieties of peaches growing at Beltsville, Md., showed material differences in varietal resistance to low spring temperatures. Following a series of spring freezes in 1938, with a low of 23° [F.] on April 10, Veteran, Viceroy, Iron Mountain, Jap Giant Cling, Mikado, Pallas, Early Wheeler, Leeton, and Triumph set fair crops of fruit, while adjacent trees of Late Crawford, Hiley, Wilma, Brackett, Gage, Palora, and Sims had practically all buds killed. At a higher location where the minimum was 26° full crops were obtained on all hardy varieties, such as Carman, Early Wheeler, and Rochester. In 1939 with equally low temperatures there was much less damage, due to a period of cool weather preceding the final freeze. Varieties with a naturally high bud set, such as Eclipse, Cumberland, and Greensboro, may produce fair crops, despite a heavy percentage loss. In 1939, when the buds were hardened by the cool period, a 25° minimum did not kill the ovaries of open flowers on real hardy varieties such as Viceroy and Veteran.

Size of aborted embryos in the Phillips Cling peach, L. D. DAVIS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 198-202, figs. 4).—An earlier paper (E. S. R., 78, p. 269) having indicated that the abortion of the embryo is closely associated with the characteristic gumming occurring in the fruit of the Phillips Cling peach, embryos taken from samples of gummy fruits collected in different orchards at intervals throughout the season were measured as to length. An analysis of the data indicated that the lengths of the aborted embryos follow much the same pattern of deviation or dispersion irrespective of average length, season, or location of the orchard where collected. Apparently the lengths of aborted embryos of this peach are approximately normally distributed and may be used in an examination of the time when abortion occurs.

The Atlantic, Pemberton, and Burlington blueberries, G. M. DABROW and J. H. CLARK. (Coop. N. J. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 589 (1940), pp. 8, figs. 5).—A description is presented of three new varieties of blueberries characterized by their very large late-maturing fruits. Atlantic was obtained from a cross of Jersey \times Pioneer, Pemberton from a cross of Katharine \times Rubel, and Burlington from a Rubel \times Pioneer cross. The quality of the Atlantic, Pemberton, and Burlington varieties is described as medium, above medium, and above medium, respectively.

The Maytime, Starbright, and Redstar strawberries, G. M. DABROW (*U. S. Dept. Agr. Cir.* 597 (1940), pp. 5, figs. 2).—Information is presented relative to the origin and the plant and fruit characteristics of three new strawberry varieties—Maytime, Starbright, and Redstar—arising, respectively, from crosses of Missionary \times Fairfax, Chesapeake \times Fairfax, and Chesapeake \times Fairfax.

Studies on the "raisining" of Alexandria (Muscat) grapes in transit, C. E. ASBURY, C. O. BRATLEY, and W. R. BARGER (*U. S. Dept. Agr. Cir. 574* (1940), pp. 11, fig. 1).—The increase in percentage of Alexandria (Muscat of Alexandria) grapes showing raisining, a condition involving both shriveling and the development of a brown color, ranged from 2.6 to 10.3 percent during a 10- to 14-day transit period in test shipments made from California to New York City. Grapes that were shriveled or brown in color when shipped contributed most to the increase of raisining in transit. Grapes that were green, yellow, or amber in color and not shriveled when shipped showed practically no raisining on arrival, but the amber-colored grapes often became slightly brown during the transit period.

A growth study of the almond fruit, R. M. BROOKS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 193-197, figs. 2).—Measurements of the embryo, endosperm, and fruit in the almond indicated that, although the third stage exhibited by fleshy fruits such as the peach is not evident in the almond, the endocarp and seed develop in the same orderly manner (*E. S. R.*, 69, p. 655). Relatively, stage 1 in the almond corresponds in its time of occurrence and duration to that of the other drupes. The relative duration of stage 2 was found much longer in the almond, continuing until maturity, and there is no third stage, that of rapid acceleration in size, such as occurs in fleshy fruits. The entire growth of the leathery mesocarp of the almond is completed in the first stage, and growth of the almond may be represented by a single sigmoid curve.

Dry weight increase curves for date fruit, W. W. ALDRICH and C. L. CRAWFORD. (*U. S. D. A.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 187-190, figs. 3).—Observations taken during 3 yr. indicated that the rate of dry weight increase of fruit pulp is at least from two to three times as rapid during late August and September as during the early part of the summer. In 1939, this acceleration began shortly after the dry weight of the seed had reached a maximum. It is suggested that the new leaves that develop in late summer may be unusually efficient in producing carbohydrates. It is possible that the increased supply of carbohydrates may result from increased efficiency of all or part of the leaf surface, from reduced use of carbohydrates by other parts of the palm, or from utilization of stored materials.

Influence of rootstocks on quality of citrus fruit, A. V. RICHARDS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 298).—In the case of Washington Navel and Valencia oranges, Satsuma and Dancy tangerines, Marsh grapefruit, and rough lemon, all trees budded on trifoliate orange, the most dwarfing of the several stocks used, bore fruit of the highest value for percentage of citric acid and with one minor exception for percentage of soluble solids. Rough lemon, the most invigorating stock used, gave the lowest values for citric acid and soluble solids. The invigorating stocks apparently hastened granulation or the drying out of juice vesicles.

Studies of the ripening of Marsh grapefruit in Arizona with especial reference to the improvement of maturity measurements, R. H. HILGEMAN (*Arizona Sta. Tech. Bul. 89* (1941), pp. [2]+95-168, figs. 8).—This study is presented in four parts, the first of which, evaluation of factors influencing the accuracy of measurements of maturity, shows that inaccuracies in field sampling may be minimized by selecting fruit of uniform size and by including in the sample fruit from various parts of the tree. The percentage of juice by volume and weight, based on the whole fruit, was higher after fruit was treated with ethylene, due to a shrinkage of the peel. Juice values varied, depending on the removal of the final fraction of juice from the pulp.

Part 2, seasonal changes in the ripening of Arizona grapefruit and their relation to maturity, reports that external color changes, although usually accompanied by changes in palatability, were not entirely adequate as a measure of maturity. Total soluble solids (Brix) increased gradually from October to midwinter and decreased in the spring. The Brix:acid ratio increased with maturity, yet the numerical value of the ratio was not in itself a satisfactory index to maturity. Juiciness was related to maturity, but by itself did not provide a sufficiently accurate index.

Part 3, analysis of data with reference to the improvement of legal maturity standards, suggests that the most satisfactory standard indicated by the study requires 35 percent minimum color and a total soluble solids (Brix):acid ratio which varies inversely with the percentage of juice by volume, the latter values to be dependent on size of the fruit.

Part 4, cultural and environmental factors affecting maturity, discusses the relation of heat summations during the growing period of irrigation, fertilizers, vegetativeness of tree, etc., to maturity. A high vegetative condition throughout the year tended to produce fruit with a low Brix and a relatively high acid content and to retard the rate of increase in these ratios.

Seasonal changes in Florida oranges, P. L. HARDING, J. R. WINSTON, and D. F. FISHER (*U. S. Dept. Agr., Tech. Bul. 753 (1940), pp. 89, pls. 5, figs. 22*).—The results of analyses of more than 13,000 individual fruits and of about 1,100 composite samples, of from 25 to 50 oranges each of the principal varieties grown in Florida are reported. The analyses included determinations of weight and diameter of fruit, color of rind and flesh, thickness of rind, flavor, ascorbic acid content, buffer capacity, pH value, total acids, total solids, sucrose, and reducing sugars of the juice. The fruit contained the most juice when it was in prime eating condition. Degree of acidity, amount of sugars, proportion of acidity to sugars, and aroma are factors affecting the quality or flavor of orange juice, and all of these are determined to a large extent by the kind of rootstock on which the fruit is grown. Higher quality resulted when the fruit was grown on sour-orange rootstock than when it was grown on rough-lemon rootstock. Greater amounts of ascorbic acid were found in oranges from outside branches that were well exposed to sunlight. A gradual decrease in ascorbic acid content was associated with ripening. Buffer capacity, ash, total solids, sucrose and reducing sugars, total soluble solids/acid ratio, and pH increased, while total acid decreased with fruit ripening. A maturity standard based on a minimum total solids content and a maximum as well as a minimum total acid content is suggested.

Floral situation, sex condition, and parthenocarp in the Oriental persimmon, R. W. HODGSON. (*Univ. Calif.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 250-252).—Observations over a 5-yr. period on some 50 varieties of Oriental persimmon suggested the existence of five groups with respect to floral situation and sex condition: (1) Pistillate, (2) pistillate-sporadically monoecious, (3) monoecious, (4) monoecious-sporadically staminate or pistillate, and (5) staminate. In 1939 there was noted a high degree of parthenocarpic development. Seedlings in the 1939 crop resulted apparently from two principal factors, the percentage of viable ovules and the efficiency of pollination.

Recognized and potential varieties of two Oriental species of chestnut, C. A. REED. (*U. S. D. A.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 498-502).—Asserting that selections of Chinese and Japanese chestnuts now being grown in the United States are sufficiently promising to indicate the establishment of a chestnut-producing industry in the near future, the author discusses improved forms and the general characteristics of the two broad types.

Since 1930 nearly 2,000 lots of Chinese and Japanese chestnuts were examined, and of some 1,500 Chinese chestnuts about 250 were rated as of the highest quality. With trees thriving and bearing good crops over a large area of the country the prospects are considered distinctly encouraging.

The effect of foliar conditions on the photosynthetic activity of pecan leaves, H. LUTZ and M. B. HARDY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 448-488).—Dark green leaves from high N trees had a higher photosynthetic rate per unit of area than did light green leaves from low N trees. There was a greater difference in CO₂ assimilation between sprayed and unsprayed leaves than between dark green and light green leaves. The unsprayed leaves were slightly lighter in color than the sprayed and in addition often contained diseased areas. Diseased leaves had less than two-thirds the assimilation rate of healthy leaves. In addition healthy leaves continued to function until severe autumn frosts. The importance of retaining foliage on the tree in a healthy condition as long as possible was indicated.

Notes on the relation of warm winter temperatures to blossoming and nut setting of the pecan, A. H. FINCH and C. W. VAN HORN. (Ariz. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 493-497).—Stating that it is well recognized that the southwest portion of pecan trees bears fewer nuts than other parts, the authors took records of the number of pistillate blossom clusters on the northeast and southwest portions of trees. The percentage of blossoming was found generally less on the southwest side, and the percentage of dropping of nuts was generally higher. With the thought that inadequate winter chilling might be a factor, orchards were studied in different localities in Arizona and California with some evidence that environment and variety are both concerned with blossoming behavior. Following the mild winter of 1937-38, leafing out occurred several days earlier on the northeast than on the southwest side of trees in the Imperial and Yuma Valleys. Various treatments, including ethylene, shading, and temperature modification were tested with varying effects on leaf development. A total of 20 varieties are arranged in their order of tolerance to warm winter temperatures.

Studies on the evaluation of factors influencing oil content and filling of pecan nuts, A. H. FINCH and C. W. VAN HORN. (Ariz. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 481-483).—In view of the fact that cultural practices or environmental conditions which lead to high vegetativeness of the tree in the summer season tend to interfere with the filling and influence the oil content of the pecan nut, trees in a low vegetative group were covered with cloth and the oil contents and filling of the nuts were observed. Aphid infestations were more severe under the shade, thus giving a combined effect of insect infestation and shade which reduced the percentage of oil in the kernel and the percentage of kernel. The desirability of adequate spacing and of pruning contacting trees is indicated.

Harvesting pyrethrum, A. F. SIEVERS, M. S. LOWMAN, and W. M. HUBER (U. S. Dept. Agr. Cir. 581 (1941), pp. 28, figs. 17).—Although studies have shown that pyrethrum flowers of acceptable potency can be grown in the United States, the lack of a practical and economical method of harvesting has prevented production on a crop basis. The authors describe the construction and operation of an experimental machine with which it is estimated that two persons can harvest flowers from at least 4 acres per day as compared with seven persons harvesting 1 acre per day when using the semimechanized method developed in Pennsylvania. The quality of the crop harvested with the experimental machine is discussed with respect to its general usefulness for various commercial products, and practical methods are described for removing

from the harvested flowers the moderate quantity of stems and leaves that were present. Extracts were made of the flowers containing the leaves and stems in the proportion that such occur, using a commercial solvent, and it was found that such extracts when used in sprays do not stain various fabrics.

Trials of annual flowers, 1940, E. I. WILDE and J. R. CULBERT (*Pennsylvania Sta. Bul. 402 (1941), pp. [2]+88, figs. 3*).—Herein are presented, chiefly in tabular form, the results of trials of 506 flower samples, of which 247, 83, and 42, respectively, were zinnias, petunias, and marigolds.

The effect of temperature and photoperiod on the growth and flowering of miscellaneous annuals, K. Post and C. L. WEDDLE (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1037-1043, fig. 1*).—Data were presented on the responses of the following species: *Antirrhinum majus*, *Oenothera cyanis*, *C. imperialis*, *Chrysanthemum frutescens*, *C. parthenium*, *C. segetum*, *Clarkia elegans*, *Delphinium ajacis*, *Matthiola incana*, *Papaver nudicale*, *Phlox drummondii*, *Salpiglossis sinuata*, and *Trachymene caerulea*.

The effects of organic materials on the growth of annuals, with special reference to petunias, K. E. WHEELER and R. C. ALLEN (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1051-1056*).—Of seven types of organic materials added to clay or sandy silt loam, all except shredded sugarcane increased flower production and growth in the petunia. In the case of muck soil and greenhouse compost, materials already high in organic matter, the responses to additional organic matter were mostly negative. Large amounts of processed moss peat tended to injure plants, especially when combined with large amounts of fertilizer.

A comparison of methods of watering greenhouse plants and the distribution of water through the soil, K. Post (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1044-1050, fig. 1*).—Potted chrysanthemums and cyclamens supplied water by subirrigation when the driest plants first commenced to wilt grew as well as comparable surface-watered plants. In the subirrigated pots there was practically no root growth through the hole in the bottom of the pot. By injecting a given quantity of water when capillary tension reached a certain point, subirrigation permitted the maintenance of a nearly constant moisture content in the soil. In the nearly flat-bottomed bed, capillary tension of the soil was greater near the edges than in the middle of the bed. Tensiometer cups placed in the middle of the bed gave sufficiently uniform readings to permit their use as a means of determining soil moisture content for practical purposes.

Carnation yield and quality as affected by watering and phosphate, G. A. BEACH (Colo. State Col.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1022-1026*).—In greenhouse studies at Cornell University it was found that heavy watering of carnations grown in greenhouse benches tends to decrease total yields and quality as measured by the percentage of split blooms. The stems averaged slightly longer on the wet plats, but the difference was not sufficient to affect economic values. The plants on the wet plats appeared superior to the casual observer, suggesting the value of careful records and their statistical analysis to determine actual differences. In a series of phosphate treatments, yield and quality of the Virginia and My Love varieties as measured by the number of blooms, percentage of split blooms, and stem length were unaffected by the addition of liberal applications of superphosphate.

Variation in blooming date of chrysanthemums in garden, frame, and greenhouse, L. E. LONGLEY (Minn. Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1001-1002*).—Observations on plants of the same varieties grown in the garden, frames, and the greenhouse showed all varieties to at-

tain the blooming stage earlier in the garden than in the frame or greenhouse. In general, blooming occurred sooner in the frames than in the house. The data suggest that factors other than length of day influence the setting of buds and the blooming of the chrysanthemum. It is suggested that the glass may have excluded some types of light or that the higher concentration of nutrients or higher prevailing temperatures may have been involved in retarding maturity.

Some factors affecting flowering and bulb production in the Creole Easter Lily, F. D. COCHRAN and T. L. VEREEN. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1031-1033).—As compared with direct planting after digging and grading, storage at both cold and ordinary temperatures resulted in a general decrease in vigor but did promote earlier flowering, a factor of distinct marketing advantage. Protection in coldframes covered with heavy cloth during cold nights increased the height of the plants and the weight of the bulbs, and insured a crop of bulbs and flowers. Disbudding as soon as the buds were large enough to pull from the stem increased the weight of the bulbs at harvest. Cutting the stalk to a 1-ft. height was detrimental to bulb development.

Cultural studies with *Lilium formosanum*, J. A. DEFANCE and F. L. HOWARD. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1027-1030).—Comparing three depths of planting, namely, 4, 8, and 12 in., it was observed that shoots of the 4-in. bulbs emerged 8 and 16 days earlier, respectively, than those of the 8- and 12-in. bulbs. However, the 8-in. bulbs bloomed slightly earlier than those in the other two lots. The average height and flower production were similar in the 4- and 8-in. lots, with both slightly superior to the 12-in. lot. There were more missing plants in the 4-in. than in either of the other two lots. Mulching was most beneficial to the 4-in. bulbs and least important to the 12-in. bulbs, and, in general, straw and leaves provided better protection than materials such as tar paper or peat. The provision for drainage by an underlying layer of gravel or cinders appeared desirable in poorly drained soils.

Culture of orchids, D. LUMSDEN and F. L. MULFORD (*U. S. Dept. Agr. Leaflet 206* [1941], pp. 8, figs. 3).—Information is presented on varieties, propagation, and culture in the greenhouse and in the home.

Effects of mineral-nutrient deficiencies and excesses upon the vegetative growth and flowering of sweet peas, K. POST (*New York [Cornell] Sta. Bul.* 745 (1940), pp. 27, figs. 7).—Hardening of sweet pea plants, manifested by small, dark-green leaves and short internodal spaces and suspected of resulting from a deficiency of N, was produced in soils high in nitrates or when the plants were grown in sand with a nutrient solution deficient in phosphate. Hardening was prevented in soils high in nitrate by the incorporation of chopped straw before planting. Soils and nutrient solutions low in nitrates caused plants to make succulent growth but increased the dropping of flower buds. Bud drop was reduced when the soil or the nutrient solution was high in nitrates. Hardening of plants was followed by decreased bud dropping.

Apparently when the culture medium was low in N the plants obtained sufficient N for satisfactory development through nodule-forming organisms. Such plants did not become hardened during early growth, but often showed a temporary insufficiency of N in their leaves. K deficiency and phosphate excess produced a marginal leaf injury followed by abscission of the older leaves. With inadequate phosphate the leaves assumed a blue-green color, the internodes were shortened, and the tendrils were purple. High N and high total salts in the seedling stage caused blue-green leaves and root injury. High K also injured the roots. It is concluded that most hardening is due to an excess of N or of total soluble salts in the soil.

The effect of native humus on flower production and vegetative growth of Souvenir roses, E. I. WILDE and C. B. LINK. (Pa. Expt. Sta.) (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 998-1000).—Using a native peat containing 52 percent organic matter, four combinations, namely, (1) 100 percent humus, (2) 50 percent humus and 50 percent Hagerstown soil, (3) 25 percent humus and 75 percent soil, and (4) 100 percent soil, were compared. All plats were fertilized and handled in the same manner. The plants in the 100-percent humus plats had the most fibrous and extensive root systems and produced significantly more flowers and more vegetative growth measured in weight of prunings and flower stems. The results suggested the desirability in rose growing of adding large amounts of native humus to soils that are low in organic matter.

Further observations on the propagation of rhododendrons and azaleas by stem and leaf-bud cuttings, H. T. SKINNER. (Cornell Univ.) (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1013-1018, figs. 2).—In this further study (E. S. R., 80, p. 200), an additional 20 varieties of ericaceous plants were propagated successfully by leaf-bud cuttings. Most varieties responded to suitable concentrations of indolebutyric acid. Rooting treatments to leaf-bud cuttings affected subsequent shoot development from axillary buds. Hormonized Dust increased the rate of shoot production and the percentage of growing plants. Liquid indolebutyric acid treatments of 6 and 12 mg. per 100 cc. delayed shoot formation and decreased the number of plants producing vegetative shoots. The rooting of leaf-bud cuttings was adversely affected by a wax coating applied to the leaves before insertion in the rooting medium. Seven hr. of additional light improved the rooting of leaf-bud cuttings of rhododendrons.

FORESTRY

[Forestry studies by the California Station] (*California Sta. [Biom.] Rpt. 1939-40*, pp. 17-20).—Included are reports on investigations of the comparative rates of transpiration of different forest species, reproduction of native timber species, and economics of pine production.

Forest resources of south Georgia, M. M. LEHRBAS and I. F. ELDRIDGE (*U. S. Dept. Agr., Misc. Pub. 390* (1941), pp. III+50, pl. 1, figs. 28).—Included is a general description of the area and the forests, together with information as to naval stores, wood products, and the future outlook.

The relationship of normal to average ponderosa pine stands of north Idaho, L. J. CUMMINGS (*Jour. Forestry*, 39 (1941), No. 1, pp. 47-48).—Ponderosa pine forests in northern Idaho under average conditions differ from yield table normal stands in that they are characterized by openings and widely spaced trees. Statistical analyses of field data showed that average well-stocked areas, as recognized by forest survey type mappers, were stocked 38 percent of yield table normal, medium-stocked areas 27 percent, and poor-stocked areas 15 percent of normal. That the samples obtained were distributed proportionately over the area studied was indicated by the fact that the plats fell in each stocking class in direct proportion to the area of the respective classes.

[Trees for Wyoming] (*Wyoming Sta. Bul. 243* (1941), pp. 14, 15, 21-22, figs. 3).—Brief information is given on the progress of investigations in the testing of trees and shrubs for farm and shelterbelt planting.

Growth-form variation in black locust and its importance in farm planting, H. HOFF (*Jour. Forestry*, 39 (1941), No. 1, pp. 40-46, figs. 2).—An examination of a large number of mature black locust stands in the eastern United States indicated that most trees may be classified into one of three major groups based on the dominant character of tree appearance regardless of site influence.

The three growth forms were as follows: (1) Pinnate growth-form-determinative, low form-point; (2) spreading growth-form-determinative, high form-point; and (3) palmate growth-form-diffusive. These forms are discussed as to geographical location, comparative value for different uses, and general characteristics.

An addition to the range of *Pinus strobus* (white pine) in West Virginia, W. J. SUMPSTINE (*W. Va. Univ. Bul.*, 40. ser., No. 5-I (1939), pp. 44-45).

Concerning the dispersion of natural regeneration, D. W. LYON and F. X. SCHUMACHER (*Jour. Forestry*, 39 (1941), No. 1, pp. 49-51, fig. 1).—Although individual seedlings of natural reproduction are not distributed at random on cut-over areas, analysis of data from the western pine type showed a remarkable consistency in the proportion of stocked quadrats of different size.

Effect of day length on dormancy in tree seedlings, J. E. PHILLIPS (*Jour. Forestry*, 39 (1941), No. 1, pp. 55-59).—Using red (680-1,400 m μ) and blue (380-510 m μ) wave lengths of irradiation to extend winter days to 18 hr., it was found in the case of potted seedlings in the greenhouse that loblolly pine, northern white cedar, and black locust grew more rapidly during long days produced by the addition of red irradiation than under other environments. Pine and locust also produced greater fresh and dry weights and the top:root ratio of the locust was greater under supplementary red light. Additional irradiation with blue light caused stunting of loblolly pine and black locust both as to fresh and dry weights. Northern white cedar did not grow as much or as rapidly under blue light. Loblolly pine and white cedar came out of dormancy at about the same time under blue light and normal daylight. Under natural short days loblolly pine and northern white cedar remained at a standstill and locust grew at a relatively slow rate until the days began to lengthen. Red gum plants had already formed an abscission layer before being brought into the greenhouse and leaf fall occurred shortly after the plants were brought indoors. Activity was resumed in early spring at approximately the same time under the three light conditions.

Fertilizing planting stock on eroded soils, T. HOLSOE. (W. Va. Expt. Sta.). (*Jour. Forestry*, 39 (1941), No. 1, pp. 69-70).—The application of 4 oz. of a 4-12-4 fertilizer at a 6-in. depth near the roots caused black locust trees to make more than twice the annual height growth of the controls. On the other hand, fertilized red pine made about the same growth as the control because of fertilizer stimulation of weeds which overtopped and shaded the pine to a harmful degree. The black locust grew faster than the weeds. It is suggested that species which start slowly and are intolerant should not be fertilized the year of planting unless weed control is practiced.

Influence of altitude and aspect on daily variations in factors of forest-fire danger, G. L. HAYES (*U. S. Dept. Agr. Cir.* 591 (1941), pp. 39, figs. 16).—Diurnal cycles for the median August day, 1935-38, of air temperature, relative humidity, wind velocity, surface duff moisture, $\frac{1}{2}$ -in.-wood moisture, and resultant forest-fire behavior class are shown by means of isograms for both north and south aspects at four pairs of stations from 2,300- to 5,500-ft. elevations on the Priest River Experimental Forest in northern Idaho. These factor measurements were made with automatically recording instruments, the anemohygrograph being specially invented to record duff moisture, wood moisture, and wind velocity. Precipitation was measured in the conventional manner and with gages sunk in the ground and the mouth cut flush with the surface slope. Duff-surface maximum temperatures were determined with standard maximum thermometers. Marked nocturnal temperature inversions were found which produced a thermal belt between 700 and 1,700 ft. above the valley

bottom. At night, within this belt, fire danger was more severe than above or below it on both north and south slopes. During the day, south slopes within the belt and north slopes above it were most dangerous. For the entire 24 hr. at any specific elevation south slopes were more dangerous than north, the difference being least at high altitudes and greatest at low.

Fire Control Notes, [January 1941] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes*, 5 (1941), No. 1, pp. II+59, figs. 5).—This issue consists of a paper entitled *A Planning Basis for Adequate Fire Control on the Southern California National Forests*, by S. B. Snow, C. A. Abell, R. L. Deering, and P. D. Hanson.

Lumber distribution and consumption for 1938, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr., Misc. Pub. 413* (1941), pp. 59, figs. 12).—Beginning with a description of the project and a statement of the general situation, tabulated data are presented with regard to lumber supply, distribution, and consumption, exports, imports, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [March 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), Nos. 4, pp. 105-127, fig. 1; 5, pp. 129-145, figs. 4).—In addition to the host-parasite check-list revision, by F. Weiss (No. 4, *Corylus* to *Cytisus*, and No. 5, *Dalbergia* to *Erythroxylon*), the following items are noted:

No. 4.—New reports on *Adelopus gaumanni* on Douglas fir in the United States, by G. G. Hahn; little-leaf disease of shortleaf and other southern pines, by E. R. Toole and T. S. Buchanan; an outbreak of cabbage black spot in the Lower Rio Grande Valley, Tex.; by G. H. Godfrey; grass diseases in Michigan in 1940, by J. R. Hardison; unusual development of cereal rusts in Oklahoma, by D. Dunn; and brief notes on an outbreak of gray spot on tomatoes in Florida, and heavy stem rust in the 1940 oat variety nursery of the Wyoming Experiment Station.

No. 5.—The citrus canker situation, and brief notes on resistance of grasses to snow mold and on *Titaecospora andropogonis*.

[Abstracts of phytopathological papers] (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 1s-25s).—Abstracts beginning on the pages indicated are: Fasciation as a Source of Deformity in Scotch Pine, by H. I. Baldwin (p. 1s); Effect of the Curly-Top Disease Upon the Phloem of *Nicotiana tabacum*, by K. Esau (p. 3s) (Univ. Calif.); The Persistence of the Sclerutal Stage of the Cotton Root Rot Fungus, *Phymatotrichum omnivorum*, in Clean Fallow and Non-Susceptible Crop Areas, by C. H. Rogers (p. 8s) (Tex. Expt. Sta.); Injury From Salt Spray and From Salt Retained in the Soil on Cranberry Bogs and in Blueberry Plantings in Massachusetts, by H. F. Bergman (p. 13s) (U. S. D. A. and Mass. State Col.); Determination of the True Dosage Mortality Curve for a Fungicide, by A. E. Dimond and J. G. Horsfall (p. 14s) (Conn. [New Haven] Sta.); Symptoms of Mineral Deficiency in Pine, by C. H. Hobbs (p. 16s) (Purdue Univ.); Experimental Production of Invading Overgrowths in Plants, by M. Levine (p. 17s); The Pathogenicity of Bacteria [*Phytomonas tumefaciens*] Causing Pathological Growth in Destroyed by Specific Amino Acids, by A. J. Riker, J. M. Van Lanen, and I. L. Baldwin (p. 18s) (Univ. Wis.); Morphological and Microchemical Factors Affecting Fungal Attack in the Deglet Noor Date Fruit, by F. M. Turrell and D. E. Bliss (p. 20s) (Calif. Citrus Sta.); Survey of Air-Borne Fungi—A Study of Methods, Regional, Climatic Factors, by A. B. Ackley and J. L. Waldbott (p. 21s); and Influence of Potassium on Chloride Toxicity in *Ananas comosus* (L.) Merr., by C. P. Sideris and H. Y. Young (p. 21s) (Univ. Hawaii).

A brief history of plant pathology, M. T. COOK. (P. R. Univ. Expt. Sta.). (*Rev. Agr., Indus. y. Com., Puerto Rico*, 32 (1940), No. 3, pp. 449-452).

[Plant disease studies by the California Station] (*California Sta. [Bien.] Rpt. 1939-40*, pp. 61-63, 69-70, 73-74, 78-82, 85-89, 89-91, 109-111, 112, 113, 114, 124-126).—Reports of progress are included on control of citrus brown rot and psorosis; granulation of Valencia oranges; water spot of oranges; new spray for bacterial blight of walnut; date fruit spoilage; avocado dieback or decline; Pierce's grapevine or California vine disease; apple dieback and internal cork; *Rosellinia* root rot of apple, pear, and ornamentals; almond crown gall cure; virus diseases and eradicator sprays for brown rot of stone fruits; peach mosaic and disorders of canning varieties; diseases of flowers, including rose mosaics, *Botrytis* spotting of gardenia and camellia, and control of California aster yellows; fungicides for rusts and mildews, and powdery-mildew studies; bacterial ring rot of potato; seed treatment of cowpea and watermelon; seed treatment of sugar beet, and southern root rot; developing disease-resistant wheats and other cereals; black-eye cowpeas and beans; and rootstocks resistant to nematodes and to the oak root fungus.

[Progress reports on plant disease work by the Delaware Station] (*Delaware Sta. Bul. 227 (1940)*, pp. 35-39, fig. 1).—Included are studies by T. F. Manns, S. L. Hopperstead, K. J. Kadow, and M. W. Goodwin on peach viruses and control of bacterial leaf spot and leaf curl diseases; wilt control in sweetpotato; strawberries resistant to red stele; spray injury; fungicidal control of cucurbit diseases; and sulfur and copper spraying and dusting materials.

[Plant disease studies by the Kansas Station]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 60-62, 105-110).—Brief reports of progress by E. C. Miller, L. E. Melchers, H. Fellows, D. B. Creager, C. H. Ficke, O. H. Elmer, C. O. Johnston, L. P. Reitz, and E. G. Heyne are included on the effects of partial and complete artificial defoliation on the yield of the wheat plant, with a view toward better understanding of reductions in yields due to leaf rust and to hail injury; cereal and forage crop disease investigations, including sorghum, wheat, oats, and alfalfa, with emphasis on combined resistance of winter wheat to leaf and stem rust races, and breeding for disease resistance in wheat, oats, and sorghum; and fruit and vegetable disease studies, including potato, sweetpotato, black raspberry, and cucumber.

[Phytopathological studies by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1939-40*, pp. 11-13).—Brief notes on work by J. H. Muncie, C. R. Megee, F. C. and M. C. Strong, D. Cation, and R. Nelson are included on bacterial wilt of alfalfa; causes of wilt and dieback in elm; control of rust on apple and cedar hosts; a new peach canker and its control; spraying for leaf blights of celery; a *Fusarium* wilt-resistant tomato; and trials of insoluble copper sprays on potato.

[Plant disease studies by the South Carolina Station]. (Partly coop. U. S. D. A. and expt. stas.). (*South Carolina Sta. Rpt. 1940*, pp. 48-60, 139-141, 184-187, figs. 2).—Reports of progress are made by C. H. Arndt, G. W. Boozer, R. Weindling, H. M. Crouch, W. B. Albert, W. B. Keller, G. M. Armstrong, C. C. Bennett, L. Shanor, B. S. Hawkins, J. F. Bullock, T. W. Graham, J. R. Mattison, and C. J. Nusbaum on cotton, including seedling-disease control by delinting and seed treatment, surveys of seedling and boll diseases, the spread and survival of the anthracnose fungus (*Glomerella gossypii*) and the pathogenicity of isolates of this and related fungi, mineral nutrition and wilt resistance of a wilt-susceptible and a wilt-resistant variety, regional wilt test, cross-inoculations with the wilt fungus (*Fusarium vasinfectum*), and pathogenicity tests of isolates of wilt fungus from different locations in two fields; tobacco diseases, including blue mold (downy mildew) and its control by gas and spray treatments, root knot control by resistant strains and rota-

tions, and a nematode (*Eucephalobus oxyuroides*) root decay new to this crop; and fungicidal control of cucurbit downy mildew.

Report of the plant pathologist, L. N. H. LARTER (*Jamaica Dept. Sci. and Agr., Ann. Rpt., 1940, pp. 22-23*).—Seasonal notes on diseases of crop plants in Jamaica, January 1, 1939, to March 31, 1940.

New and interesting plant diseases, W. C. MOORE (*Brit. Mycol. Soc. Trans., 24 (1940), pt. 3-4, pp. 345-351, pls. 2*).—Notes on leaf spot of lettuce found due to *Septoria lactucae*, and a disease of *Colchicum* corms caused by *Pythium ultimum*.

The symptoms and diagnosis of minor-element deficiencies in agricultural and horticultural crops.—II, Copper, zinc, molybdenum, C. S. PIPER (*Empire Jour. Expt. Agr., 8 (1940), No. 31, pp. 199-206, pl. 1*).—This continues the review previously noted (E. S. R., 84, p. 60), with 26 additional references.

Techniques for appraising air-borne populations of microorganisms, pollen, and insects, E. B. LAMBERT ET AL. (*Phytopathology, 31 (1941), No. 3, pp. 201-225, figs. 5*).—It is evident from this review (97 references) that students of different phases of aerobiology use a wide variety of technics. In each field there are a few methods which seem especially adapted for a particular kind of work, and, conversely, each type of apparatus has its advantages and limitations. These matters are discussed in detail and critically evaluated.

The central bureau for fungus cultures, Baarn (Netherlands): List of cultures, 1940, J. WESTERDIJK (*Centraalbureau voor Schimmelcultures, Baarn (Holland): List of cultures, 1940. [Amsterdam]: Nederland. Akad. Wetensch., 1940, pp. 136, fig. 1*).—This is the current list of available cultures (E. S. R., 81, p. 621).

Some fungi from the Atlantic islands and the Portuguese colonies, M. DE SOUSA DA CÂMARA and C. GOMES DA LUZ (*Bol. Soc. Broteriana, 2. ser., 13 (1938-39), pp. 95-99, figs. 4*).—Descriptions and notes are given for *Hemileia coffeicola* on coffee leaves, *Tilletia horrida* on rice, *Paranectria carrissiana* n. sp. on coffee leaves, *Coniothyrium coffeae* on coffee fruits, *Diplodina lycopersici* on tomatoes, and *Gloeosporium lagenarium* on pumpkins.

The investigation of superficial fungi by the impression method [trans. title], H. WENZL (*Zentbl. Bakt. [etc.], 2. Abt., 100 (1939), No. 14-17, pp. 327-342, figs. 5; abs. in Ohron. Bot., 6 (1940), No. 5, p. 103*).—Films of celloidin or gelatin placed on fungus-covered substrata and allowed to dry are removed and the enclosed mycelium and spores examined microscopically.

Thermal death point of fungi in relation to growing conditions, L. LING and E. H. YU (*Phytopathology, 31 (1941), No. 3, pp. 264-270, fig. 1*).—As measured by conidial viability in suspension after a 10-min. exposure to constant temperature, the thermal death point varied from 2° to 4° C. among monosporous strains within a single species of *Colletotrichum*. It also varied slightly within a single strain under the influence of incubation temperature, reaction of medium, or available nutrients. Thermal resistance was greater at two different places in the pH scale, when incubation temperatures were high and when nutrition was adequate for a vigorous normal growth. The thermal death point range was 44°-50° for *C. nicotianae*, 48°-52° for *C. gossypii*, and 48°-51° for *C. glycinea*.

Comparisons of crown gall bacteria having normal, attenuated, and restored virulence, J. M. VANLANEN, I. L. BALDWIN, and A. J. RIKER. (Univ. Wis.). (*Jour. Bact., 41 (1941), No. 1, pp. 95-96*).—An abstract.

The genus *Fusarium* in Argentina: Studies and systematic classification, II [trans. title], C. M. CARRERA (*Rev. Argentina Agron., 7 (1940), No. 4, pp. 277-296, figs. 12*).—A continuation of studies previously noted (E. S. R., 84, p. 481), with 14 references.

Comparative studies of sugar-beet and potato isolates of *Rhizoctonia solani*, E. L. LECLEBG. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 3, pp. 274-278).—Four isolates from potato stem lesions and 6 from sclerotia did not differ significantly in hyphal diameters, but 9 of the 10 sugar-beet isolates were significantly smaller than any of the potato isolates. The sugar-beet isolates grew faster on potato-dextrose and high-nitrogen media than any of 3 types of potato isolates. Of the latter, those from stolon lesions grew fastest, those from stem lesions next, and those from sclerotia slowest. The mature-plant and sclerotial isolates from potatoes all had an optimum at 25° C. or below, whereas 30° was optimum for 19 of the 20 sugar-beet isolates. Likewise, those potato-stolon isolates not causing dry rot canker of sugar beets had an optimum of 25°. The stolon-lesion isolates causing dry rot canker of sugar beets grew best at 30°. As a group, sugar-beet isolates caused more damping-off of sugar beets, beans, peas, and cabbage than any of the 3 groups of potato isolates. Those from potato-stolon lesions, as a group, reduced stands of sugar beets and peas more than potato stem-lesion or sclerotial isolates. Isolates from potato stem lesions and from sclerotia, as groups, did not differ significantly in ability to cause damping-off of the hosts tested, although the former group of isolates was more aggressive on peas. On cabbage, the 3 types of potato isolates did not differ significantly in reducing emergence of cabbage.

Studies on *Rhizoctonia solani* Kühn.—V, Virulence in steam sterilized and natural soil, G. B. SANFORD (*Canad. Jour. Res.*, 19 (1941), No. 1, Sect. C, pp. 1-8, figs. 2).—In these further studies (E. S. R., 79, p. C36), the virulence on potato stems in general decreased as the proportion of inoculum in steam-sterilized soil increased. Sclerotia developed and mycelia massed much more frequently and abundantly in the higher concentrations of soil inoculum. Thus conditions favorable to marked vegetative growth of the pathogen appeared to depress its virulence. The evidence also suggests that new and vigorous hyphal growth necessary for sclerotial formation is initiated primarily by high relative humidity of the soil air. Isolates pathogenic to potato may differ greatly in virulence and in sclerotial formation, and it also seems that the *Corticium* stage is an important source of pathogenic and sclerotium-bearing strains. Soil-grown inoculum 180 days old proved as virulent as the freshly grown.

Investigations of the effect of low temperatures on the germinability and infectiousness of conidia of *Sclerotinia cinerea* and *S. fructigena* [trans. title], W. BUCKSTEEG (*Ztschr. Pflanzenkrank. u. Pflanzenschutz*, 50 (1940), No. 10, pp. 507-512).—Decreases in germinability and ability to cause infection followed subjection to temperatures considerably below 0° C.

A heritable lysis in germinating chlamydospores of *Sphacelotheca sorghi*, T. LASKARIS. (Minn. Expt. Sta. et al.). (*Phytopathology*, 31 (1941), No. 3, pp. 254-263, figs. 2).—The abnormality under study, occurring in germinating chlamydospores produced by certain monosporidial combinations of *S. sorghi*, was characterized by disintegration of the promycelia prior to or after the formation of sporidia and by production of promycelia and sporidia decidedly atypical in morphology and size. Measurements showed the chlamydospores, promycelia, and sporidia of such crosses to be significantly larger than those of normal crosses, in some cases easily exceeding the limits for the species. Some association was apparent between the amount of deviation from normal and the degree of lysis. By appropriate crosses it was shown that the tendency toward lysis is characteristic of certain combinations of monosporidial lines only. This is regarded as evidence that the tendency is due to genetic factors. It was also shown that the lytic tendency is not necessarily associated with solopathogenicity in *S. sorghi*. Of 322 monosporidial lines tested for solopathogenicity, only 1 produced chlamydospores, and then in only one of three tests,

Variation in the germination of chlamydospores of *Ustilago zeae*, M. F. KERNKAMP and M. A. PETTY. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 1, pp. 333-340, figs. 2).—In chlamydospore germination studies (14 crosses and collections), using agar drops under constant environment, 25 types were observed. Of these, the production of the supposedly normal 4-cell promycelium, with a sporidium on each cell, was neither most characteristic nor most prevalent. The number of cells per promycelium ranged from 1 to 8. Variations were also noted in the number of promycelial cells giving rise to hyphal branches or sporidia, and in the number of chlamydospores from which sporidia grew directly and the number with promycella on two sides. The germination type varied with the cross or collection, and the differences between were much greater than those within crosses and collections, one type usually predominating in each. Since the environment was constant, the variations were probably due to genetic differences among the crosses and collections.

Tegillum, a new genus of the Uredinales, E. B. MAINS (*Bul. Torrey Bot. Club*, 67 (1940), No. 8, pp. 705-709, figs. 7).—This new rust fungus genus and *T. fimbriatum* n. sp. from leaves of *Vitex* sp. are described.

Physicochemical viewpoints for the problem of virus activity [trans. title], L. HOLZAPFEL (In *Advances in Enzymology and Related Subjects, I*, edited by F. F. NOB and C. H. WERKMAN. New York: Interscience Pubs., Inc., 1941, vol. 1, pp. 43-62, figs. 7).

Conclusions and problems regarding experimental investigation of plant viruses (with ultramicroscopic illustrations) [trans. title], G. A. KAUSCHE (*Ber. Deut. Bot. Gesell.*, 58 (1940), No. 4, pp. 200-222, pls. 3, fig. 1).—A review of recent work by the author and his associates.

The effects of alkali and some simple organic substances on three plant viruses, F. C. BAWDEN and N. W. PIRIE (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1278-1292).—Using alkali and 15 organic substances on three viruses, tomato bushy stunt virus proved most resistant to denaturation and potato "X" virus least so. The effects of alkali on tobacco mosaic virus were complex and are described. With bushy stunt virus inactivation without loss of serological activity occurred over a wider pH range, and crystalline noninfective preparations could be made from alkali-treated material. Apparently similar crystalline and noninfective preparations could be isolated from expressed sap allowed to age for some months. In the presence of alkali, sodium dodecyl sulfate readily destroyed all the viruses, separating the nucleic acid from the proteins. Except for nicotine and arginine, which form reversible, fibrous precipitates with tobacco mosaic virus, all the substances tested at concentrations below 4 M inactivated the viruses in neutral solution. Dilute solutions of these agents were often precipitants, whereas concentrated ones dissolved the products of denaturation. Inactivation of tobacco mosaic and potato "X" viruses was usually accompanied by separation of the nucleic acid from the protein, but that of bushy stunt virus was not. There are 59 references.

The inactivation of some plant viruses by urea, F. C. BAWDEN and N. W. PIRIE (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1258-1277, fig. 1).—Tobacco mosaic, potato "X", tomato bushy stunt, and tobacco necrosis viruses were found to be irreversibly denatured by urea, with loss of infectivity and serological activity. For each virus there was a critical urea concentration below which there was no irreversible effect on infectivity, this being smallest for potato "X" and largest for bushy stunt. The inactivation rate was greatly increased by alkali, it was minimum at about 20° C., and was much increased by cooling to -10°. Inactivation of purified tobacco mosaic virus by urea proceeded only slightly more slowly than that of virus in crude infective sap. Inactivation of tobacco mosaic and

potato "X" viruses was accompanied by separation of the nucleic acid and protein, but that of bushy stunt and tobacco necrosis viruses was not. Changes in absorption spectra accompanying inactivation are described. There are 118 references.

The nature of disease resistance in plants, I, S. A. WINGARD. (Va. Expt. Sta.). (*Bot. Rev.*, 7 (1941), No. 2, pp. 59-109).—In this comprehensive, analytical review (295 references) the author takes up the types of disease resistance, misconceptions regarding it, environal relations of disease development, and genetic behavior of disease resistance.

The nature of disease resistance. (Univ. Minn.). (*Chron. Bot.*, 6 (1940), No. 5, pp. 105-106).—A review of a few recent contributions.

The interaction of higher plants and soil micro-organisms.—II, Study of the microbial population of the rhizosphere in relation to resistance of plants to soil-borne diseases, M. I. TIMONIN (*Canad. Jour. Res.*, 18 (1940), No. 9, Sect. C, pp. 444-456, pls. 2, fig. 1).—Continuing these investigations (E. S. R., 84, p. 447), contact slide method studies indicated a greater number of micro-organisms in the rhizosphere than in soil distant from the roots, and showed differences between the rhizosphere of varieties of flax resistant and susceptible to wilt and of tobacco resistant and susceptible to black root rot which agreed with results from the plating method.

Seed treatments for control of plant diseases (*Wyoming Sta. Rpt.* 1940, p. 7).—Brief notes on recent results with seed treatments for cereals and potatoes, including a new material, Cinnex 20, for the latter.

Cereal root-rot investigations and control factors, R. SPRAGUE. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 3, pp. 19-22).—The root infections of cereals in North Dakota are mainly of the so-called common root rot group, believed to be due to a complex of fungi the most prevalent of which are species of *Helminthosporium* and *Fusarium*. A brief progress report and review setting forth the present status of the trouble and its control is presented. Where the situation is serious more crops resistant to root rot, such as oats, are recommended, together with good seed treated with New Improved Ceresan, protection of the soil against blowing and resulting loss of top soil, and avoidance of excess root rot trash and pigeon grass. More use of grass is considered desirable, with oats or some resistant crop to follow it for two seasons after breaking the sod.

Treatments for control of grain smuts, J. M. RAEDER (*Idaho Agr. Col. Ext. Cir.* 69 (1940), pp. 10, figs. 4).—An informational circular.

A technique for identifying the loose smuts of barley, V. F. TAPKE (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 3, pp. 284-286, fig. 1).—When a suspension of spores is flooded over an agar plate, then drained off for even spore distribution, the smut species is identified as *Ustilago nuda*, *U. nigra*, or a mixture of both if the spores form, respectively, only mycelial threads, only sporidia, or a mixture of both at 65°-70° F.

Resistance to floral-infecting loose smut (*Ustilago nuda*) in fall-sown barley varieties at Statesville, North Carolina, G. K. MIDDLETON and W. H. CHAPMAN. (N. C. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 4, pp. 351-353).—When 10 strains of fall-sown barley were inoculated, wide differences in varietal susceptibility were observed, but even in the most susceptible strains the percentages of infection were highly variable. More consistent results were obtained by use of dated heads 3-5 days out of boot.

Infection studies on the covered smut of oats, P. F. BRANDWEIN (*Bul. Torrey Bot. Club*, 67 (1940), No. 8, pp. 673-691).—Studying *Ustilago levis* infection in Monarch (highly susceptible) and Black Mesdag (moderately susceptible) oats

under controlled conditions, an effective period of infection was found in the seedling. The growth rates of these two varieties and of Markton oats during this effective period proved remarkably similar. Under suitable infection conditions, the growth rate at 48-66 hr. after planting increased about 480 percent over that during the first 48 hr., and in this 48- to 96-hr. period rapidly decreasing infection percentages occurred. Unequal infection in susceptible seedlings may be explained on the basis of growth and maturation, except that the resistance of Markton cannot be explained on the basis of growth rate but is believed to be due to a specific internal factor unfavorable to the fungus. Under the experimental conditions, inoculation did not result in adverse effects on the resistant host. Regional infection studies indicated that whereas the smut fungus may penetrate and develop in the mesocotyl, sporulation does not follow. Penetration of the coleoptile apparently results in the highest sporulating infection. It is thus suggested that the relationship of oats to the smut fungus is controlled by (1) a specific internal factor analyzable on genetic bases, (2) environmental factors, and (3) a growth factor. While the first factor controls true resistance, the other two control the amount and extent of infection in susceptible seedlings. "Seedling invasion," "nonsporulating infection," and "sporulating infection" are suggested terms for clarifying discussions of systemic infection by oats smut.

Ophiobolus graminis Sacc. var. *avenae* var. n., as the cause of take all or whiteheads of oats in Wales, E. M. TURNER (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 3-4. pp. 269-281).—The new variety and the histopathology of infection are described.

Longevity of sclerotia of the stem-rot fungus *Leptosphaeria salvinii*, E. C. TULLIS and E. M. CRALLEY. (Ark. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 3, pp. 279-281).—Viable sclerotia of this rice fungus were isolated from uncultivated soil after 6 yr., from field stubble after 2 yr., and from stubble stored in the laboratory after about 2½ yr.

Blight and other damage of durum wheat in 1940 (*North Dakota Sta. Bul.* 296 (1941), pp. 14, figs. 3).—This study is in two parts, as follows:

I. *Effect on macaroni-making quality*, R. H. HARRIS and L. D. SIBBLITT (pp. 3-8).—The results of this preliminary study indicate that blight and other forms of damage (*Helminthosporium*, *Alternaria*, *Fusarium*, etc.) adversely affect the quality of the semolina and macaroni produced from such infected wheat. The principal effects were a decided increase in number of specks in the semolina associated with a decrease in semolina and macaroni color. The semolina yield was also decreased. Heavily damaged kernels with extensive injury on the surface and in the crease most strongly decreased quality, but light injury still increased the speckiness and degraded the color rating.

II. *Effects of blights and other damage on durum and hard wheat seed*, W. H. BRENTZEL (pp. 9-14).—Studied from the seed standpoint, damage was found due to black points, resulting from infection by *Alternaria* and *Helminthosporium*, and to various other types of injury which included the greater part of the defects observed, viz, a little *Gibberella* scab, some bacterial infection, and a number of weakly parasitic or nonparasitic molds. There was also damage from weathering, sprouting, shriveling, and other defects which were grading factors and unassociated with seed or seedling diseases. Seed germination and seedling vigor in most samples were improved by Ceresan treatment. The fungi most frequently found were kinds not originating from the seed from which the plants grew, and therefore will not develop in subsequent crops from sowing damaged seed. However, the moldy condition of much of the grain and the prevalence of smut were sufficient to demand seed treatment. Recommendations are given.

The relative values of seed injured by rust, frost, or drought, J. G. C. FRASER (*Sci. Agr.*, 21 (1941), No. 6, pp. 307-314).—From experiments with eight samples of the 10B strain of Marquis wheat, representing eight kinds of physical properties in their kernels, grown in replicated 5-row plots for 3 yr. in Ontario and Saskatchewan and for 2 yr. in Manitoba, it was concluded that plump seed is preferable to rusted seed and usually gives somewhat higher yields. If rusted seed is used, a much higher rate of seeding is necessary to compensate in part for lack in size and general vigor. Whereas plump, well-matured, uniform grain of good germination is preferable for seed purposes, nevertheless where germination and pedigree were satisfactory the yields between poorest and best quality seed in these tests, where any significance was obtained, were never greater than 4.7, 4.2, and 2.6 bu., respectively, at the three stations.

Rust-resistant wheats for India, K. C. MEHTA and B. P. PAL (*Nature [London]*, 146 (1940), No. 3690, p. 98).—The search for wheats which will stand up against the rusts (black, brown, and yellow) present in India is said to have resulted in the finding of strains from Kenya possessing a promising degree of resistance.

Physical properties of alfalfa mosaic virus, M. A. LAFFIE and A. F. ROSS (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 12, pp. 3296-3300, figs. 4).—The sedimentation constant found was 73.9 by 10^{-13} cm. per second on unit centrifugal field, with a probable error of ± 5.2 by 10^{-13} , the specific volume was 0.673, and an average molecular weight of 2.1×10^6 and an average particle diameter of 16.5 $m\mu$ were calculated. The evidence indicated the virus preparations to be composed of a single kind of particles in which there was a distribution of frictional coefficients and perhaps electrical charges about a modal value. A portion of the pH mobility curve on the basic side of the isoelectric point was determined, and the isoelectric point was estimated from solubility studies to be about pH 4.6.

Bean improvement and bean diseases in Idaho, D. M. MURPHY (*Idaho Sta. Bul.* 238 (1940), pp. 22, figs. 11).—The production of seed and dry beans is of major importance in Idaho, and Great Northern and Red Mexican dry beans are of special value. Several Great Northern varieties resistant to common bean mosaic have been developed, and Great Northern U. I. 15, the most recent one released, is resistant also to curly top. Red Mexican U. I. 3 and U. I. 34 have recently been released and are resistant to both viruses. Many promising selections of various field and garden beans are still under test. Vine, pod, and seed characteristics of Great Northern and Red Mexican selections are described, and yields of the various selections tested are presented. Great Northern U. I. 15 may prove of special value for areas usually severely infested with beet leafhoppers. Data are presented showing the percentages of curly top, common bean mosaic, and yellow bean mosaic and the length of the growing season of several Great Northern bean selections. Symptoms of bean diseases important to Idaho are described and their control measures discussed.

Inoculation of cotton plants in sand culture with *Phymatotrichum* root rot, A. A. DUNLAP. (*Tex. Expt. Sta.*). (*Phytopathology*, 31 (1941), No. 4, pp. 558-561, figs. 2).—Cotton grown in washed sand-nutrient solution in the greenhouse was inoculated by placing *P. omnivorum* sclerotia near the center of a small mound of Houston black clay soil built up around the stem at the surface of the sand. A large proportion of the plants so treated became infected, as shown by permanent wilting within 8 weeks afterwards.

Cotton wilt [trans. title], J. A. DESLANDES (*Campo [Rio de Janeiro]*, 9 (1938), No. 107, pp. 62-63, figs. 2).—On cotton wilt (*Fusarium vasinfectum*) symptoms and control in Brazil.

The yellow disease of lettuce and endive, M. B. LINN ([*New York*] *Cornell Sta. Bul.* 712, 1910), pp. 33, figs. 16).—This disease is a limiting factor in the production of late-summer and fall crops on Staten Island. In the present study (1935-36), one genus (*Cichorium*), including curled-leaf endive and broad-leaf endive or escarole, is reported, in addition to the 170 species of plants previously noted as suspects of the eastern aster-yellows virus. Experiments with viruliferous leafhoppers on 23 lettuce varieties and strains showed all to be equally susceptible. The disease has been reported from the principal lettuce-producing States and also from Bermuda and Ontario. Yellows in endive occurs principally in lower New York State and New Jersey. The characteristic symptoms are discussed. On Staten Island the virus has been found to overwinter chiefly on the common plantain, *Plantago major*. The exact manner of overwintering of the vector there has not been determined. Apparently it seldom if ever occurs in the egg stage, but may occur in the adult stage at a considerable distance from cultivated areas. The vector is driven into the weeds during harvesting of crops, but later may move back into crop beds. It was found that wind direction may play a large part in determining the direction of leafhopper movements, which does not occur in perceptible numbers much farther than 200 ft. in 4 weeks. Weed eradication within 100 ft. of prospective lettuce and endive beds, by means of sodium chlorate crystals or spray, resulted in appreciable control of yellows at a cost of \$33-\$36 per acre of weeds. Roguing in small plantings was of little value for control, but dusting with either pyrethrum-sulfur dust containing at least 0.15 percent pyrethrins, or with 1 percent rotenone-sulfur dust, at weekly intervals from transplantation to harvest, gave significant decrease. Growing young lettuce plants in cloth-covered coldframes or screened greenhouses prior to transplanting resulted in a considerable reduction of yellows at harvesttime.

Powdery mildew of potato in Kentucky, W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 4, pp. 357-358).—This disease, found on greenhouse-grown potatoes in the fall, is assigned to *Erysiphe cichoracearum* on the basis of conidia and perithecia.

Studies on the nature of spindling sprout of potato, G. K. PARRIS and W. W. JONES. (Hawaii Expt. Sta.). (*Phytopathology*, 31 (1941), No. 4, pp. 340-346, fig. 1).—Spindling sprout was not transmitted by grafting. When normal Bliss Triumph tubers were grafted with cores from spindling-sprout tubers, the eyes of the normal tubers were stimulated and a larger number of healthy stems were produced than by normal tubers or by normal tubers grafted with cores from normal tubers. Eyes from normal tubers grafted into spindling-sprout tubers formed shoots normal in leaf and stem development. Indications were found that it is possible to eliminate spindling sprout from a tuber population by seed selection at harvest. Chemical analyses of spindling-sprout and normal tubers indicated that the former contained a higher concentration of reducing sugar, sucrose, acid-hydrolyzable materials, soluble nitrogen, ammonia, and amino nitrogen than the normal tubers, and for the first two fractions the differences were perhaps large enough to be considered significant. Spindling sprout may possibly be due to an inability of apical meristems of tuber buds to synthesize proteins. The basis of this abnormal physiology is still unknown.

The application of protective inoculation as a means of controlling virus diseases of potatoes [trans. title], J. O. BOTJES (*Tijdschr. Plantenziekten*, 46 (1940), No. 6, pp. 181-183; *Ger. abs.*, pp. 191-192).

Bacterial ring rot of the potato: Investigation on possible dissemination by grasshoppers, W. E. BRENTZEL and J. A. MUNRO (*North Dakota Sta. Bul.*

295 (1940), pp. 8, figs. 2).—Grasshoppers allowed to devour considerable portions of infected potato plants and immediately transferred to healthy plants failed to transmit the disease, though bacteria similar to *Phytophthora septentrionalis* were recovered from the alimentary tracts of individuals that had fed on such plants. The tests were under fairly well controlled conditions in the greenhouse and under natural conditions in the field, but in no case did the grasshoppers infect healthy plants. The bacterium was widely distributed throughout diseased plants but occurred in greatest numbers in the stolon end of small tubers and in stems immediately above the seed pieces. The principal source of dissemination appears to be infected seed, contaminated implements, and storage-contaminated facilities.

Suggestions for control of bacterial ring rot of potatoes, V. E. IVEYSON and H. C. KELLY (*Montana Sta. Cir.* 161 (1940), pp. 6, figs. 2).—An informational contribution setting forth the symptoms and recommended precautions and control measures.

Blind seed disease of rye-grass, A. E. MUSKETT and E. L. CALVERT (*Nature [London]*, 146 (1940), No. 3693, pp. 200-201, fig. 1).—Observations and inoculations indicate the *Helotium*-like apothecia found on dead rye-grass to be the perfect stage of the blind seed fungus, which is shown to be the cause of the blind seed disease of ryegrass in Northern Ireland. It was also shown that *Pullularia* sp. commonly found associated is nonparasitic and, therefore, the name "*Pullularia* disease" should be discarded.

Agronomic practices that aid in the control of sugar beet curly-top (*Sugar Beet*, 3 (1940), No. 4, pp. 10-11, fig. 1).—High fertility, early planting, and adequate irrigation are briefly discussed.

Curley-top resistant varieties, F. V. OWEN. (U. S. D. A.). (*Sugar Beet*, 3 (1940), No. 4, pp. 8-9, fig. 1).—Note on the development, seed production, and field care of resistant sugar beet varieties.

Mineral nutrition of sunflower when sound and when attacked by broomrape, T. T. DEMIDENKO and V. V. KISSELEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 3, pp. 277-280).—During growth, more mineral matter was absorbed by affected than by normal plants. Summing up the total ash absorbed by an affected plant and later conveyed to the parasite, it was found that at the time of flowering the host and its parasite together absorbed more nutrients from the soil than did the sound plants, but the latter were higher in nutrient matter when fully mature. Details are summarized.

Collection of articles on the diseases of tobacco [trans. title] (*Vsesoiuzn. Nauch. Issled. Inst. Tabach. i Makhor. Promysh.* [Krasnodar] [Bul.] 141 (1940), pp. 196).—The following articles, in Russian with English summaries, are included: Thermal Method for Disinfecting Tobacco and *Nicotiana rustica* Seeds, by S. E. Grushevoi (Grooshevoy), I. P. Khudyna, and A. A. Popova (pp. 3-29); Chemical Method for Disinfecting the Seed-Bed Substrate, by S. E. Grushevoi, P. M. Levykh, P. G. Ruzinov (Roozinov), and R. G. Nikolaeva (Nikoloyeva) (pp. 30-41); The Possibility of Obtaining Seed-Bed Soil Free of Infection in Compost Heaps, by S. E. Grushevoi and P. M. Levykh (pp. 42-48); Conditions for Disinfecting Seed-Bed Soil by Gratuitous Sources of Heat, by S. E. Grushevoi, P. M. Levykh, and E. I. Malbieva (pp. 49-61); Treatment of the Roots of Seedlings Before Transplanting in the Control of Tobacco and *Nicotiana rustica* Diseases, by S. E. Grushevoi and A. A. Popova (pp. 62-77); Chemical Method in the Control of Powdery Mildew of Tobacco, by S. E. Grushevoi and P. M. Levykh (pp. 78-96); The Effect of Temperature and Air Humidity on the Affection of Tobacco With Powdery Mildew (*Oidium tabaci* Thuem), by P. M. Levykh (pp. 97-111); The Relation of Some *Nicotiana tabacum* L. Varieties and Some

Nicotiana Species to the Affection With Tobacco-Mosaic Virus, by I. P. Khudyna (pp. 112-124); The Effect of the Dates of Planting Tobacco on Its Affection With *Orobancha ramosa* L. Under Conditions of Yalta Region, by P. G. Ruzinov and R. G. Nikolaeva (pp. 125-135); The Possibility of Using *Fusarium* sp. in the Control of *Orobancha ramosa* L. on Tobacco, by P. G. Ruzinov, R. G. Nikolaeva, and A. I. Kulish (Koolish) (pp. 136-157); and The Effect of Fertilizers on the Affection of *Nicotiana rustica* With Wild Fire and *Orobancha ramosa* L. (pp. 158-175) and Agricultural Methods in the Control of Wild Fire of *Nicotiana rustica*, both by A. A. Popova (pp. 176-195).

The relationship between boron and thallium toxicity of tobacco, G. M. SHEAR and R. L. SCHNELL (Va. A. and M. Col. and Expt. Sta.). (Va. Acad. Sci. Proc., 1940, p. 213).—An abstract.

Tobacco downy mildew in the tobacco-growing region of Salta and Jujuy [trans. title], E. F. GODOY and A. D. COSTE (Rev. Argentina Agron., 7 (1940), No. 3, pp. 221-227, figs. 4; Eng. abs., p. 226).—An account is presented of an epidemic (1939) in these Argentinian provinces, ascribed to *Peronospora nicotianae* (with 10 references).

Gas treatment for the control of blue mold disease of tobacco, E. E. CLAYTON, J. G. GAINES, K. J. SHAW, T. E. SMITH, and T. W. GRAHAM. (Coop. Ga. Coastal Plain, N. C., S. C., and Md. Expt. Stas. et al.). (U. S. Dept. Agr. Leaflet 209 (1941), pp. 8, figs. 2).—Directions are given for use of benzol and paradichlorobenzene, with most detail given to the latter method.

A copper-soap spray for control of tobacco downy mildew, R. R. KINCARD. (Fla. Expt. Sta.). (Phytopathology, 31 (1941), No. 3, pp. 286-288, figs. 2).—A home-made spray, keeping for weeks and with excellent wetting, spreading, and adhesive properties, is reported to have controlled *Peronospora tabacina* in Florida on flue-cured tobacco plant beds and cigar-wrapper tobacco in the field without adverse effects, although cigar-wrapper seedlings were stunted. The spray consists of 1.75 lb. CuSO_4 , 7 lb. high-grade oleate soap, and 100 gal. water.

The sulfur distribution in tobacco mosaic virus protein, A. F. ROSS (Jour. Biol. Chem., 136 (1940), No. 1, pp. 119-129).—Well dialyzed virus protein isolated by differential centrifugation of the nucleic acid-free component was found to contain 0.68 percent cysteine or cystine, thus accounting for all or nearly all of the sulfur. This sulfur probably exists as cysteine. Traces of sulfate sulfur were present in some samples and absent in others. When the virus was hydrolyzed with HI, a small amount of volatile iodide was formed and the amount could be reduced by dialysis of the protein. However, it was proved that most of the volatile iodide could not have been methyl iodide; hence it seems that this virus does not contain methionine.

Epinasty of tomato, one of the earliest symptoms of *Fusarium* wilt, F. L. WELLMAN. (U. S. D. A.). (Phytopathology, 31 (1941), No. 3, pp. 281-283, fig. 1).—Studied under controlled conditions, epinasty of leaves and stems of inoculated tomato seedlings appeared to be a common symptom of early infection by *F. bulbigenum lycopersici*. This response was accompanied by root initiation and resembled similar effects induced by certain chemical treatments and bacterial infections.

Development of interspecific tomato hybrids of horticultural value and highly resistant to *Fusarium* wilt, W. S. PORTE and F. L. WELLMAN (U. S. Dept. Agr. Cir. 584 (1941), pp. 19, figs. 5).—Both in the field and in standardized greenhouse tests the Currant tomato (*Lycopersicon pimpinellifolium*) proved highly resistant to wilt due to *F. bulbigenum lycopersici*. By hybridization and backcrossing with the Marglobe tomato variety many of the valuable horticultural qualities of its best lines were combined with the high resistance of the

Currant-tomato parent, thus leading to the production of a number of horticulturally acceptable, highly wilt-resistant lines, which are being developed by further selections in widely differing environments. Special technics for breeding and testing for resistance and a dependable method of rating relative wilt resistance were used.

Direct seeding of tomatoes for production and disease control, M. SHAPOVALOV. (U. S. D. A.). (*Utah Agr. Col. Ext. [Cir.] 105, n. ser. (1940), pp. 25-27.*)

Wilt-resistant watermelons, C. D. SHERRAKOFF (*Tennessee Sta. Cir. 78 (1941), pp. [4], fig. 1.*)—On the basis of results obtained in limited tests in Tennessee and in other States, it is considered safe to recommend that Tennessee growers give a fair trial to the Hawkesbury watermelon wherever wilt is a factor.

Immunity of fruit trees to fungus diseases, N. V. KOVALEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 2, pp. 176-179.*)—A discussion of experiences with apple, pear, and quince, indicating a correlation between the degree of resistance of a species and its origin, with a summary of specific cases encountered and recommendations to breeders arising from the evidence.

X-ray detection of mouldy-core in the Delicious apple, L. W. TILLER and E. R. COOPER (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 3A, pp. 168A-169A, fig. 1.*)—From the tests outlined it is believed evident that X-rays do not offer a practical means of detecting fruits affected with moldy core.

Some nuclear phenomena in *Venturia inaequalis*, E. J. BACKUS and G. W. KEITT. (Univ. Wis. et al.). (*Bul. Torrey Bot. Club, 67 (1940), No. 9, pp. 765-770, pls. 2.*)—A study of the development of the ascus and of nuclear phenomena in the vegetative mycelium, conidiophore, and conidium in the apple scab fungus.

Experiments with eradicant fungicides for combating apple scab, G. W. KEITT, C. N. CLAYTON, and M. H. LANGFORD. (Wis. Expt. Sta.). (*Phytopathology, 31 (1941), No. 4, pp. 296-322, figs. 6.*)—Applications (3 yr.) of eradicant spray to a small Wealthy apple orchard after harvest and before leaf fall greatly reduced the ascospore inoculum (*Venturia inaequalis*) the following year, and the ensuing scab epidemics were retarded and reduced. Spray injury from such fall treatments led to ground-spraying tests in the spring of 1939 in which treatment of the floor of a McIntosh orchard shortly before bud break with 1 percent Elgetol Extra, 450 gal. per acre, greatly reduced the effective ascospore inoculum, retarded and reduced the following epidemic, and appeared to facilitate substantially the control by summer spraying. The dosage of primary inoculum proved to be a major factor in determining the time and intensity of development of epidemics and of requirements for their control. Recommendations for orchard practice are withheld pending further studies in progress.

Eradicant sprays for apple scab, H. W. ANDERSON and D. POWELL (*Ill. State Hort. Soc. News Letter 6 (1940), p. [1].*)

False sting—a virus disease of apples, J. F. HOCKEY (*Sci. Agr., 21 (1941), No. 5, pp. 242-243, fig. 1.*)—A malformation of apple fruits resembling injuries from insect feeding and superficially appearing somewhat like stony pit of pears was first observed in 1934. Observations since that time have shown the condition to occur on several varieties, and it has been successfully transmitted through grafting. It is apparently a virus infection.

Taxonomic and pathogenicity studies of the fungi which cause decay of pears in Washington, W. H. ENGLISH (*Wash. State Col. Res. Studies, 8 (1940), No. 3, pp. 127-128.*)—An abstract of a Ph. D. dissertation previously noted in part (E. S. R., 75, p. 494).

Fusarium species causing rots of stone fruits [trans. title], C. J. M. CARRERA (*Lilloa*, 5 (1940), No. 2, pp. 169-180, pls. 3; *Ger. abs.*, p. 169).—The author presents a short historical summary (6 references) of studies of various *Fusariums* on stone fruits, reports his own results in infecting fruits and branches, and demonstrates the presence of diastase and presents illustrations showing the progress of decay following inoculation.

Cherry yellows (physiological yellow leaf) in New York, E. M. HILDEBRAND and W. D. MILLS. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 4, pp. 355-356).—Yellow leaf of sour or pie cherries (*Prunus cerasus*), first described in New York as a nonparasitic disease in 1919, now seems to be similar to if not identical with the bud-transmissible cherry yellows virosis of Wisconsin. Records indicate its presence in New York every year since 1928. Its earliest recorded appearance during these years varied from June 16 to July 6, and by July 15 leaf fall had usually terminated for the season. Though agreeing in leaf symptoms and time of leaf fall, affected trees in New York suffer less than in Wisconsin from the more severe injury to the spur system, possibly because of climatic or other differences.

Peach trees dying in Virginia, S. A. WINGARD. (Va. Expt. Sta.). (*Va. Fruit*, 28 (1940), No. 10, pp. 10, 12, 14).—This is an account of trees dead or dying from crown injury during the summer of 1940, ascribed to sudden drops in the preceding fall temperatures when the bark and wood at that point were still immature. Other causes of loss of trees in the State are briefly noted, together with factors influencing winter injury and suggested preventive measures.

Host range of peach-mosaic virus in western Colorado, E. W. BODINE and L. W. DURRELL. (Colo. Expt. Sta., U. S. D. A., et al.). (*Phytopathology*, 31 (1941), No. 4, pp. 322-333, figs. 3).—After varieties of almond, apricot, cherry, and plum had been inoculated with the peach mosaic virus only the Hungarian prune plum and the Montgamet apricot developed mosaic symptoms, though all *Prunus* types inoculated were found to be infected. After a total of 1,340 plum, apricot, and almond trees in commercial peach orchards had been grafted with healthy Elberta peach scions no infection with the peach mosaic virus was observed to follow. Spontaneous mosaics observed on apricot, cherry, and plum, but not those on flowering peach, were found to be caused by viruses other than that of peach mosaic. A survey (1935-39) of the incidence of peach mosaic indicated that eradication of affected trees arrested its spread in orchards planted to the Elberta and J. H. Hale varieties. In those containing such varieties as Carman, Salwey, Guinn, Victor, and Phillips Cling in addition, the spread was not arrested by persistent eradication. Grafting Elberta test scions on 200 Carman, Guinn, Salwey, Wonderful, and Victor trees gave variable results. In many cases where no peach mosaic symptoms were evident in the stocks slight to moderate symptoms were expressed in the growth of the scions, and in other cases where slight symptoms were observed in the stocks moderate to severe symptoms appeared in the scions, but numerous trees showed symptoms in neither stock nor scion.

A new case of rosette mosaic on peach, E. M. HILDEBRAND. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 4, pp. 353-355, figs. 2).—This virus disease, previously reported only from Michigan, was found on a single tree in one New York State orchard. Marked stunting, extreme shortening of the internodes, and clustering of the wavy-marginal leaves into rosettes at the terminals were observed. A similar wavy-leaf condition sometimes accompanied by chlorotic spots in cool weather has been encountered only in the case of prune mosaic

on peach. Transmission tests, though leaving little doubt as to the identity of this trouble with the Michigan disease, do raise the question of a possible relationship to prune mosaic.

Virus diseases of red currants (*Ribes rubrum*) [trans. title], A. G. WINTER (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 50 (1940), No. 10, pp. 512-520, figs. 7).—Descriptions of the known types of virus infection found on this plant.

Purple leaf spot of strawberry, A. G. PLAKIDAS (La. State Univ.). (*Phytopathology*, 31 (1941), No. 3, pp. 225-240, figs. 4).—The symptoms of this new disease are said to be so like those of the leaf scorch due to *Diplocarpon carliana* that the two may easily be confused in the field. The spots are reddish purple at first, becoming brown and necrotic with age but never developing the grayish white centers characteristic of the common *Ramularia* leaf spot. Purple leaf spot was found to be due to *Mycosphaerella louisianae* n. sp., which produces ascospores on the dead leaves throughout the year, but most abundantly in late spring and early fall. Ascospores have also been produced occasionally in culture, but no conidial stage has been found. Conclusive cultural evidence is also offered of the connection between *M. fragariae* and *R. tulasnei*.

Citrus viruses, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 31 (1941), No. 4, pp. 356-357).—Two citrus viruses are described under names following the author's previously suggested rule (E. S. R., 84, p. 635). These are *Citriovir italicum* for the virus of infectious mottling of citrus and *C. psorosis* for the psorosis virus. Two varieties of the latter are designated as var. *vulgare* for the commoner psorosis A type and var. *annulatum* for the less common B type.

Bud-shoot wilt of citrus nursery trees, F. F. HALMA. (Univ. Calif.). (*Calif. Citrog.*, 26 (1941), No. 4, pp. 86, 106-107, figs. 2).—Attention is called to a physiological abnormality characterized by sudden wilt and subsequent death of the initial sprout of fall-budded trees. On the basis of the limited study it appears that incomplete union of the conductive tissues of bud and rootstock prevents sufficient sap flow to the sprout to sustain it during sudden hot and dry weather.

A disease of citrus in the Parahiba Valley [trans. title], A. A. BITANCOURT (*Biologico*, 6 (1940), No. 9, pp. 268-269).—The author calls attention to a new root disease in this citrus-growing region of Brazil. So far as preliminary observations go it has been found only on sweet oranges grafted on sour orange stock. The symptoms are said to resemble those of a disease previously observed by the author in the Province of Corrientes, Argentina.

Phytophthora citrophthora, cause of root rot of orange trees and gummosis of lemon trees in Corrientes [trans. title], M. J. FREZZI (*Rev. Argentina Agron.*, 7 (1940), No. 3, pp. 165-171, pls. 4, figs. 2).—A study is presented relating to the characteristics and cultural behavior of the fungus, infection trials, and control of the disease in this Argentinian province. There are 19 references.

The decline disease or Omphalia root rot of date palms, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt.*, 16 (1939), pp. 7-8).—A historical account (13 references) of this disease, which was apparently unknown before 1921, with the proposal that the more specific name "*Omphalia* root rot" be applied to it.

Olive knot induced on species of the Oleaceae by artificial inoculations, C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 31 (1941), No. 4, pp. 361-362, fig. 1).—Inoculations of species of Oleaceae with *Phytophthora sarcocaulis* resulted in knot development on the following: *Olca capensis*, *O. ferruginea*,

O. laurifolia, *O. verrucosa*, *Forestiera neomexicana*, *Osmanthus americanus*, and *O. aquifolium*. Negative results were obtained with six species of *Ligustrum*, *Syringa vulgaris*, and *S. persica laciniata*.

Oidium in relation to replanting in mid-country, D. C. GORDON-DUFF (*Ceylon Rubber Res. Scheme, Quart. Cir.*, 17 (1940), No. 2, pp. 131-139).—This is a general discussion of factors influencing the course of *Oidium* mildew infection of rubber trees and methods of control, with the conclusion that this disease is no bar to midcountry (i. e., elevations of 800-1,500 ft.) replanting.

Diseases of flowers and other ornamentals, R. E. SMITH. (Calif. Expt. Sta.). (*Calif. Agr. Col. Ext. Cir.* 118 (1940), pp. 108, figs. 40).

Orchid diseases [trans. title], A. KEVORKIAN (*Rev. Agr., Indus. y Com., Puerto Rico*, 32 (1940), No. 3, pp. 345-346).—Brief notes on diseases of the leaves, pseudobulbs, and rhizomes.

The black rot of *Barbarea vulgaris*, W. H. BURKHOLDER. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 4, pp. 347-348).—A disease resembling cabbage black rot occurs on *B. vulgaris*. Though the pathogen was similar to *Phytophthora campestri* in culture, the two did not cross-infect. The new pathogen is named *P. barbariae* n. sp.

Tar spot of American holly, E. S. LUTTRELL (*Bul. Torrey Bot. Club*, 67 (1940), No. 8, pp. 692-704, figs. 16).—This common disease, apparently occurring throughout the host range, produces yellow lesions becoming necrotic by the end of the first year but with unaffected parts usually continuing to function for the normal 2-yr. period. The causal fungus is transferred from *Macroderma curtisii* to *Phacidium curtisii*. The morphology and life history of the fungus and the host-parasite relations are discussed and illustrated in some detail.

Canker of red bud (*New Jersey Stat. Nursery Disease Notes*, 13 (1940), No. 6, pp. 21-24).—This note calls attention to a dieback of *Cercis canadensis* due to *Botryosphaeria ribis chromogena* which has been observed on ornamental plantings for the last 3 yr. Inoculation experiments are summarized and control measures suggested.

Diseases of trees: Latest findings on various infections of trade importance reported in recent research studies, L. R. TEHON (*Amer. Nurseryman*, 72 (1940), No. 11, pp. 26-27).—Leaf curl (*Taphrina* spp.) of maples and *Verticillium* wilt of elm are briefly discussed.

Nectria canker of northeastern hardwoods in relation to stand improvement, T. J. GRANT and T. W. CHILDS. (U. S. D. A. et al.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 797-802).—Data on 75 widely scattered sample plats of hardwoods (mostly in New Hampshire and Vermont) indicated one-third to be free of cankers and about one-third each to be 1-10 and 11-80 percent cankered. Data were also obtained from strip surveys in four moderately to severely cankered stands. The frequency of *Nectria* cankers on a given species varied greatly. The relative susceptibility of the principal hardwood species was not the same on all areas, but yellow birch was generally somewhat more susceptible than paper birch, red maple, and sugar maple, and beech was infected lightly or not at all. Cankering of highly susceptible commercial hardwoods was positively correlated with elevation, abundance of weed hardwoods, and degree of purity of the stand. Correlations between cankering and diameter at breast height were highly significant to slightly negative. The average number of cankers per infected tree was usually so large as to suggest inherent differences in susceptibility within the various host species. It appeared probable that damage could be materially reduced by good forestry practices. Cankering is so variable in occurrence that specific control measures must be adapted to each particular case. In general, emphasis should be placed on

discrimination against weed and cankered trees and on forming and maintaining well-mixed, vigorous stands.

Top rot in glaze-damaged black cherry and sugar maple on the Allegheny Plateau, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 963-965, figs. 2).—These species, damaged in a glaze storm in 1936 were examined 40 and 48 mo., respectively, afterwards to determine the extent of visible decay. Practically all top wounds in both species were infected by top rot fungi. It is believed that the common wound parasites causing most of the top rot in cherry will eventually die and the wounds heal. Black cherry 3 in. in diameter or less at the break is considered a good risk for saw-timber production, provided the breaks are confined to the branches and the upper part of the main stem and are accompanied by vigorous crown regeneration. Sugar maples 40-50 yr. old did not have heartwood, and decay was definitely limited to the wound area.

Top rot in snow-damaged yellow poplar and basswood, E. R. ROTH (*Jour. Forestry*, 39 (1941), No. 1, pp. 60-62).—Examination (June 1939) of *Liriodendron tulipifera*, *Tilia glabra* (= *americana*), and other hardwoods damaged by snow in the fall of 1935 in the Fernow Experimental Forest near Parsons, W. Va., suggested a possible relationship between top rot commonly found in older stands and storm damage.

Red heart of paper birch, W. A. CAMPBELL and R. W. DAVIDSON (*Jour. Forestry*, 39 (1941), No. 1, pp. 63-65, fig. 1).—*Torula ligniperda* was isolated from 80 percent of red heart samples of *Betula papyrifera*, and is believed to be one of its causes. Although the condition is not usually considered decay, old red heart was often soft and brashy. It occurred in both seedlings and sprouts in about the same proportion, provided butt rot was absent; hence it cannot be regarded as a defect peculiar to sprouts. Decayed trees had more red heart than those not attacked by wood-rotting fungi, and regardless of conditions most trees 50 yr. old were affected.

The biology of *Polyporus basilaris*, H. E. BAILEY (*Bul. Torrey Bot. Club*, 68 (1941), No. 2, pp. 112-120, figs. 4).—Field studies on the occurrence of *P. basilaris* pocket rot in Monterey cypress (*Cupressus macrocarpa*) indicated only 2 percent of the trees infected by the time they were 26 yr. old, in one stand, whereas, in another, 88 percent were infected at the average age of 65 yr. The rot was usually limited to the bole, only occasionally reaching the branches or roots. In the incipient stages only small pockets were found, but these increased and finally coalesced to form large masses of decayed wood. Sporophores recurring season after season were found on both living and dead trunks, sporulation occurring for periods up to 45 days. Sporulating fruiting bodies and spore germination were obtained in culture. Cultured on specially prepared cypress blocks, the growth rate was very slow. Analyses of wood samples which had lost 10.2, 18.1, and 39 percent weight during decay exhibited a progressive utilization of many of the wood components.

Studies on the cultural experiments of the fern rusts of *Abies* in Japan, S. KAMEI (*Hokkaido Imp. Univ., Col. Expt. Forests Res. Buls., Extra No. [2]* (1940), pp. [1]+191, pls. 7, figs. 7).—A monographic study.

External features correlated with top rot in Appalachian oaks, G. H. HEPTING, K. H. GARREN, and P. W. WABLICK. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 11, pp. 875-876, figs. 2).—In this study, based on 333 trees cut on 10 commercial logging operations, the trees were divided into 5 risk classes, depending on the number of large rotten stubs, surface injuries, and blind knots evident on the bole, and the average cull associated with each risk class was determined. Trees practically free of major wounds or stubs remained

sound to a high age, but the poorer risk trees with one or two large rotten branch stubs or three or more blind knots per bole began to develop considerable top rot at 50-100 yr. of age in the black oaks and at 100-150 yr. in the white oaks.

Relative susceptibility to *Cronartium ribicola* of 5-needled pines planted in the East, R. R. HERR. (U. S. D. A. et al.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 932-937).—A 2-yr. study is reported for two New York State localities where 11 species of 5-needle pines were exposed to natural inoculation and later grown in plantations subject to the prevailing weather conditions. *Pinus lambertiana*, *P. excelsa*, and *P. parviflora* died in such large numbers following the season of inoculation that the results for them were not tabulated, though the last species did develop some infection. No infections occurred in *P. cembra helvetica*, which thus appears to be as resistant here as in Europe. *P. monticola* and *P. flexilis* proved more susceptible than *P. strobus*, and the remaining species were less so in the following order: *P. strobiformis* (= *ayacahuite*), *P. peuce*, *P. koraiensis*, and *P. aristata*.

Developing resistance to blister rust, A. J. RIKER and T. F. KOURA (*Wis. Conserv. Bul.*, 5 (1940), No. 10, pp. 35-37, figs. 3).—This brief note summarizes the present status of selection and testing of individual white pine trees apparently showing resistance to blister rust in Wisconsin.

Fused needle disease and its relation to the nutrition of *Pinus*, H. E. YOUNG (*Queensland Dept. Agr. and Stock, Div. Plant Indus. (Res.) Bul.* 17 (1940), pp. IV+108, figs. 36).—This monographic study considers the distribution of the disease in Australia and other countries and the symptoms, causes, and factors influencing it. The trouble is thought to be one of a number of closely related abnormalities, and it has become a limiting factor in establishing pines in certain localities. Experiments have indicated that no factors save soil appear to have any direct influence on the condition, and the practical application of fertilizer treatments in general plantations practice is described and discussed. It is believed that some upset in the mycorrhizal equipment is primarily responsible, and this theory and studies relating to it are discussed in detail. The lack of raw organic matter possessing relatively high phosphate contents is believed conducive to the development of faulty mycorrhizal systems, with the resultant abnormal growth of the trees. A carbohydrate theory for the physiologic role of tree mycorrhizas is set forth as an adjunct to the nitrogen-mineral salt theory, and experiments supporting this idea are described. The idea is advanced that normal mycorrhizas supply the trees with an essential part of their carbohydrate supply, and it is to the inefficient functioning of these mycorrhizas in this respect that the fused needle disease is believed due.

Fire wounds on loblolly pine and their relation to decay and other cull, K. H. GARREN (*Jour. Forestry*, 39 (1941), No. 1, pp. 16-22, fig. 1).—Of 2,703 loblolly pines examined in six localities, 16 percent had one or more fire wounds, and in one locality 30-77 percent of associated species of unfelled hardwoods had such wounds evident at the surface. Fire wounds on pine were predominantly in the smaller width classes. Trees surviving fire and living in the stand just before cutting had suffered wounds of comparatively low width from earlier fires and of greater width from more recent fires. The size of fire wounds on surviving loblolly pines was directly proportional to the tree diameter at time of wounding. Healing was proportionately faster in wounds of large than of small widths. Wounds 1-3 in. wide resulted in practically no cull, regardless of their age, those 4-6 in. in cull of minor importance, those 7-12 in. in considerable cull after 30 yr., and those over 12 in. wide in con-

siderable cull after 10 yr. Cull volume increased approximately with the square of the wound width. Considering wound width independently of age, it could be shown that the percentage of the tree rendered useless from wounding increased with width of wound. Wounds 7 in. wide resulted in 9-12 percent loss in lumber. The rate of increase in cull decreased with increase in wood density behind the wound. Cull following wounding was usually due to a combination of decay, highly resinous wood, and wood showing insect injury. The greater part of the cull for all wound sizes is attributed to decay, but resinous cull is somewhat important in the two smallest wound-width classes. The percentage of wood showing insect infestation increased directly with increased wound width.

Rosy canker of London plane associated with illuminating-gas injury, C. MAY, J. M. WALTER, and P. V. MOOK. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 4, pp. 349-351, fig. 1).—This canker of London planetree, believed due to illuminating gas in the soil, is described and called "rosy canker" from the characteristic color of freshly proliferated tissue.

Leaf-spot diseases of poplars caused by *Septoria musiva* and *S. populiicola*, G. E. THOMPSON. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 3, pp. 241-254, figs. 3).—The perfect stages of *S. musiva* and *S. populiicola* are described, respectively, as *Mycosphaerella populorum* n. sp. and *M. populiicola* n. sp. Greenhouse inoculation demonstrated that *M. populorum* is pathogenic on 26 species and varieties of poplars, with 2 species resistant. Similar tests with *M. populiicola* showed it to be pathogenic on 3 species, with 21 remaining unaffected. The optimum temperatures as determined for *M. populorum* and *M. populiicola* were about 27° and 21°-24° C., respectively. During spring and summer (1936) ascospores of *M. populorum* were discharged after rains from May 1 to August 29.

Investigations on wood destruction by *Fomes hartigii* and *F. robustus* [trans. title], K. LOHWAG (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 50 (1940), No. 10, pp. 481-494, figs. 7).—A histopathological study of the effects of *F. hartigii* on silver fir and of *F. robustus* on durmast oak (*Quercus sessiliflora*).

Fungi associated with stain in chemically treated green lumber, A. F. VERRALL (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 3, pp. 270-274).—The relative frequency of the various staining fungi isolated from stain developing in untreated pine lumber and that treated with ethyl mercuric chloride or a mixture of sodium tetrachlorophenolate and sodium 2-chloro-orthophenylphenolate (1-1) was about the same with both treatments and with untreated controls. In hardwoods there was a decrease with both treatments in the frequency in stained areas of all stain fungi except *Endoconidiophora coeruleascens*, which showed an increase over the untreated. There is no apparent build-up in nature of strains resistant to the chemical treatments. Most failures in industry are due to poor handling practices and prolonged wet periods rather than to direct failure of the chemicals.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife conservation, I. N. GABRIELSON (*New York: Macmillan Co., 1941*, pp. XV+250, pls. 32, figs. 24).—The basic facts in wildlife conservation are presented in practical form, emphasis being placed upon the various programs for the conservation of soil, water, forests, and wildlife, so closely interwoven that each vitally affects one or more of the others.

The orientation of animals: Kineses, taxes, and compass reactions, G. S. FRAENKEL and D. L. GUNN (*Oxford, Eng.: Clarendon Press, 1940*, pp. VI+[2]+

352, figs. 135).—The object of this book is to give an account of those reactions of animals which used to be called "tropisms." The first part describes the main categories of these reactions in a manner suitable for undergraduates and teachers. The second part reviews recent work for advanced students and research workers.

Age classes of winter cover used by the eastern bobwhite (*Colinus virginianus*) in southern Iowa, M. F. BAKER. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 15 (1940), No. 1, pp. 3-11, pl. 1).

Natural pheasant production in relation to agricultural land-use, D. L. LEEDY. (Ohio State Univ. et al.). (*Ohio State Univ., Abs. Doctoral Diss.*, No. 33 (1940), pp. 115-124).—Studies of *Phasianus colchicus torquatus* are reported.

Some parasites of the eastern crow (*Corvus brachyrhynchos brachyrhynchos* Brehm), B. B. MORGAN and E. F. WALLER. (Univ. Wis., Iowa State Col., et al.). (*Bird-Banding*, 12 (1941), No. 1, pp. 16-22).—Report is made of the finding of parasites in 112 crows examined during the years 1938-39 and 1939-40. Seventeen of these were collected in southern Wisconsin and the remainder from five different counties in Iowa. The parasitic fauna of the 81.2 percent of these crows that were parasitized was found to be heavy and the parasites widely distributed. Four species of *Mallophaga* (*Philopterus corvi* (L.), *Degeeriella rotundata* (Osborn), *D. secundaria* (Osborn), and *Myrsidea interruptata* (Osborn)) and one species of *Acarina*, belonging to the family Anagesiidae, were noted. Five species of protozoa (*Trypanosoma avium* Danil., *Leucocytozoon sakharoffi* Sambon, *Plasmodium relicum* Huff, *Haemoproteus danilewskii* Kruse, and *Isospora* sp.) were identified. The immature form of *Collyriclum faba* Koss. was encountered in 7 crows. Two species of cestodes (*Hymenolepis* (*Weinlandia*) *corvi* Mayh. and *H. (Wardium) variabile* Mayh.) were found. Four species of nematodes (*Capillaria contorta* Crep., *Acuaria anthuris* Rud., *Microtetrameres helix* Cram, and *Diplotrichaena tricuspis* Fedtsch.) were recorded, and a microfilaria was found in the blood stream.

The occurrence of helminths and coccidia in partridges and pheasants in Denmark, H. MADSEN (*Jour. Parasitol.*, 27 (1941), No. 1, p. 29-34).—The findings in the examination for endoparasites of 143 adults and 56 partridge chicks (*Perdix perdix*) and 169 adults and 67 pheasant chicks (*Phasianus colchicus*) from various game-keeping areas in Denmark are reported. In addition to coccidia, an echinostome, cestodes, an acanthocephalan, and nine species of nematodes were detected. The echinostome, apparently *Echinostoma revolutum*, has not heretofore been reported from pheasants. The finding of *Dispharynx spiralis* in the partridge is said to furnish a new European host record. *Capillaria columbae* from partridges and *C. collaris* from pheasants are new host records for these parasites.

Tamerlanea bragai, a parasite of pigeons in Puerto Rico, J. F. MALDONADO and W. A. HOFFMAN. (P. R. Univ. Expt. Sta. et al.). (*Jour. Parasitol.*, 27 (1941), No. 1, p. 91).—Record is made of the South American trematode *T. bragai* as a parasite of the pigeon in Puerto Rico, in which it is restricted to the kidney and urethra.

The northern copperhead in Iowa, R. M. BAILEY. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1940), No. 1, pp. 1-2).

Bufo marinus as a vector of helminth ova in Puerto Rico, W. A. HOFFMAN and J. L. JANEZ (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 16 (1941), No. 3, pp. 501-504; *Span. trans.*, pp. 505-509).—In work under laboratory conditions it has been demonstrated that ascaris, whipworm, and schistosome ova may pass unharmed through the giant toad subsequent to ingestion, that the ascaris

and whipworm ova can be cultured to the vermiform stage, and that the schistosome ova can give rise to infections in the molluscan intermediate and laboratory definitive hosts. It is pointed out that the toad, seeking a substitute for its preferred food, consumes the coprophagous maggots and in doing so may also ingest the helminth ova. The presence of such ova and coprophagous maggots in the toad intestine serves as an indication of soil pollution. The giant toad may also function as a distributing agent of the snail (*Australorbis glabratus*), living specimens of which were recovered from a toad captured near Rio Piedras, although usually such snails succumb. It is concluded, however, that the benefits conferred by this toad on the island probably outweigh its draw-backs. The results of fecal examinations are reported in detail in table form.

Cutaneous myiasis in a box turtle. D. B. McMULLEN (*Okla. Acad. Sci. Proc.*, 20 (1940), pp. 23-25, figs. 2).—Report is made of a case of parasitism of *Terapene ornata* by *Sarcophaga cistudinis* Ald., 11 adult flies having been reared from 25 pupae from larvae that migrated from the infested turtle.

A valuable forage fish of North Dakota. H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 3, pp. 15-16, fig. 1).—The northern fat-headed minnow (*Pimephales promelas promelas*) represents a large percentage of the total number of forage fish that occur in the lakes and smaller streams of North Dakota and thus constitutes an important source of food for the larger game fish. This minnow appears to be well adapted to water of high salinity and alkalinity.

The contribution, which constitutes a progress report of work relating to influence of artificial lakes and ponds upon the immediate environment in relation to kinds and abundance of animal life, includes a description of this minnow, its spawning and food habits, and management.

Embryology of insects and myriapods. O. A. JOHANNSEN and F. H. BUTT (*New York and London: McGraw-Hill Book Co.*, 1941, pp. XI+462, figs. 370; rev. in *Science*, 93 (1941), No. 2411, pp. 257-258).—The developmental history of insects, centipedes, and millipedes from egg deposition to hatching is dealt with in 21 chapters, with a bibliography of 37 pages. The review is by R. E. Snodgrass.

Notes on the reactions of certain insects to different wave-lengths of light. H. B. WEISS, F. A. SORACE, and E. E. MCCOY, JR. (*Jour. N. Y. Ent. Soc.*, 49 (1941), No. 1, pp. 1-20, figs. 7).—These notes on the responses of certain species of insects to light of different wavelengths are considered to indicate the general behavior of a majority of these organisms at a particular time.

The geographical distribution of insect pests. A. M. ADAMSON (*Trop. Agr. [Trinidad]*, 18 (1941), No. 3, pp. 43-47).

[Entomological investigations]. (Partly coop. U. S. D. A.). (*California Sta. [Bien.] Rpt.* 1939-40, pp. 36-37, 43, 44-45, 50-61, 68-69, 74-78, 97-99).—A report on progress (*E. S. R.*, 81, p. 238) which mentions control studies for the following: Fly strike, ticks and mites on poultry, citrus thrips, greenhouse thrips on oranges, citrus bud mite, citrus red mite, orange tortrix, scale insects on citrus, red spider on walnut, walnut husk fly, codling moth on walnuts, grape bud beetle, Pacific mite on grapes, pear and grape thrips, peach twig borer on almonds, green stinkbug on peaches, snowy tree cricket on raspberries, olive and brown apricot scales, mealy plum aphid, aphids on apples, codling moth on apples and pears, corn earworm on tomatoes, and the artichoke plume moth. Other work noted included the comparison of fumigants and oil sprays, observations on citrus fumigation for scales, the use of water sprays for citrus, the value of beneficial insects for control of scales and other pests, cotton insect

investigations, tests on the use of metaldehyde for slugs and snails, studies on garden centipedes, and progress on bee investigations with reference to bee breeding stock and the protection of bees from spray poisoning.

[Entomological investigations by the Delaware Station] (*Delaware Sta. Bul.* 227 (1940), pp. 21-27, 28-30).—A brief progress report (E. S. R., 83, p. 85) of work by L. A. Stearns, D. MacCleary, K. J. Kadow, M. W. Goodwin, R. L. Pierpont, J. M. Amos, F. C. Daigh, and W. A. Connell which mentions insecticide investigations; mosquito control work; important insects of the year; parasites in relation to oriental fruit moth; research on the codling moth, plum curculio, and strawberry weevil; and studies on ticks found in Delaware.

[Entomological investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt.* 1939-40, pp. 104, 110-119).—A progress report (E. S. R., 80, p. 796) which notes experiments with bee investigations (feeding substitutes for pollen and management of two-queen colonies), fruit and vegetable insects (cankerworms, the redbud aphid *Aphis paucicarpae* Hottes, redbud whitefly *Trialeurodes* n. sp., redbud leafhoppers, and the juniper midge *Contarinia juniperina* Felt), and the strawberry leaf roller, all by R. L. Parker; climate and injurious insect investigations and alfalfa, grass, and allied plant insects, including grasshoppers, the soil webworm *Nomophila noctuella* D. & S., sod webworms (vagabond crambus, *Crambus mutabilis* Clem., and *C. hemiochrellus* Zeller), rapid plant bug, tarnished plant bug, cactus borer *Melitara dentata* Grote, syrphid flies reared from cactus (*Copestylum marginatum* and *Volucella* sp.), and a cerambycid borer, *Monolema annulatum* Say, both by R. C. Smith; wheat insects (the hessian fly, sawfly, wheat strawworm, bee fly, wireworms, and the white grub *Phyllophaga lanceolata* Say and several flies attacking it), by R. H. Painter and H. R. Bryson; corn insect studies, including the corn earworm, the pentatomid *Thysanota custator*, chinch bugs, and a sugarcane rootstock weevil, *Anacetrinus deplanti* Cdy., by D. A. Wilbur and Bryson; staple crop insects (wireworms, the southern corn rootworm and flies reared from it, and the white grub *P. submucida*), by Bryson; biology and control of the codling moth, by Parker and P. G. Lamerson; resistance of crops to insects attacks, including hessian fly resistance in winter wheat and corn earworm resistance in corn, by Painter, L. P. Reitz, R. W. Jugenheimer, and E. G. Heyne; and the effect of different systems of management of grasslands and conservation areas upon the grasshopper population, by Wilbur, R. Fritz, and K. L. Anderson.

[Entomological investigations by the Michigan Station] (*Michigan Sta. [Bien.] Rpt.* 1939-40, pp. 20-22).—This notes research progress on the control of codling moth, mites on raspberries, and grape berry moth, as well as tests conducted to determine the effectiveness of methyl bromide as a greenhouse fumigant and the sticking qualities of certain oils.

The insect pest record for Oklahoma, 1939, F. A. FENTON. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc.* 20 (1940), pp. 99-102).

[Entomological investigations of the South Carolina Station]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt.* 1940, pp. 60-68, 121-127, 131-138, 187-188, figs. 6).—A progress report (E. S. R., 83, p. 518) of work by F. Sherman, W. M. Upholt, O. L. Cartwright, J. G. Watts, F. F. Bondy, C. F. Rainwater, N. Allen, J. U. Gilmore, and J. G. Watts of studies of the cowpea curculio, oriental fruit moth, tomato fruitworm, scale insects and mealybugs on peaches and apples, corn earworm, cotton insects (bollweevil and plant lice), soil injury from calcium arsenate, tobacco flea beetle, and the asparagus beetle.

[Work in economic entomology in Canada] (*Canada Min. Agr. Rpts.*, 1938-39, pp. 7-21; 1939-40, pp. 11-26).—Further reports are made of work with economic insects, both injurious and beneficial (E. S. R., 81, p. 808).

Insects of Brazil, A. DE COSTA LIMA (*Insetos do Brasil. Rio de Janeiro: Escola Nac. Agron., 1940, vol. 2, pp. [1]+351, figs. 228*).—This second volume of the work noted (E. S. R., 81, p. 541) is devoted to the Hemiptera, a bibliography accompanying most of the 18 superfamilies considered.

[Contributions on economic entomology] (*Jour. Ent. Soc. South. Africa, 1 (1939), pp. 1-136, figs. 7; 2 (1939), pp. 18-133, figs. 10; 3 (1940), pp. 1-178, pls. 8, figs. 18*).—Among the contributions presented are the following:

Vol. 1.—On the Biology of *Craticulina tabaniformis* F. (Diptera: Sarcophagidae) Which Breeds in the Nests of Sand Wasps *Bembex* F. (Sphegidae), by A. Cuthbertson (pp. 1-8); Studies in African Trypetidae, With Descriptions of New Species, by H. K. Munro (pp. 26-46); and On the Control of Temperature and Humidity of Air in Small Cabinets, by M. N. S. Immelman (pp. 131-136).

Vol. 2.—The Status of *Wohlfahrtia evittata* Vill. (Diptera: Sarcophagidae) as a Parasite of the Brown Locust, by H. A. D. Van Schalkwijk (pp. 18-35); Preliminary Field Experiments on the Attractiveness of Certain Chemicals and Bait Carriers to the Hoppers of the Brown Locust, by C. du Plessis and D. H. Botha (pp. 74-92); A Preliminary List of the Insect Pests of Crops and Fruit Trees in Portuguese East Africa, by A. C. Saraiva (pp. 101-114); and Field Tests of Poison Bait Against Hoppers of the Red Locust, 1935-36, by W. G. H. Coaton (pp. 115-133).

Vol. 3.—Glimpses of the Development of Entomological Science in South Africa, by A. J. T. Janse (pp. 1-8); The Pioneer Period of Economic Entomology in South Africa, by C. P. Lounsbury (pp. 9-29); On the Life-Histories of Some South African Lepidoptera, by G. C. Clark (pp. 42-56); A New Species of *Triphleps* [*T. thripoborus*] (Hemiptera-Heteroptera: Anthocoridae) Predacious on the Citrus Thrips *Scirtothrips aurantii* Faure in the Transvaal, by A. J. Hesse (pp. 66-71); Further South African Gall-Forming Trypetidae (Diptera), With Descriptions of New Species, by H. K. Munro (pp. 76-87); Three New Parasitic Mites (Acarina) From South Africa [*Pygmephorus crassipes* n. sp., *Tenuipalpus micheli* n. sp., and *T. quadrisetosus* n. sp.], by R. F. Lawrence (pp. 109-115); *Hemitarsonemus latus* (Banks) (Acarina), a Mite of Economic Importance New to South Africa, by M. M. J. Lavoipierre (pp. 116-123); The Cowpea Weevil, by M. J. Oosthuizen and F. X. Laubscher (pp. 151-158); and A Note on Some Mite Parasites of *Locusta migratoria migratorioides* R. & F., by R. F. Lawrence (pp. 173-178).

Important insect predators of India, K. A. RAHMAN (*Indian Acad. Sci. Proc., 12 (1940), No. 3, Sect. B, pp. 67-74*).

Experiments in controlling corn ear pests in Puerto Rico, W. K. BAILEY (*Puerto Rico Sta. Cir. 23 (1940), pp. 23, figs. 4*).—As a result of 16 yr. of breeding and selection at the station a variety of sweet corn, known as U. S. D. A. 34, has been developed which with favorable soil moisture conditions and moderate fertilization can be grown successfully in Puerto Rico throughout the year. Due to the prevalence and severity of the infestation of the ears by the corn earworm, fall armyworm, and the corn-silk fly *Buxesia stigmatias* Loew, no attempt has been made to supply the demand of the New York market with fresh corn during the late fall, winter, and early spring months, at which time it has been off the market. Measures tested for the control of these three pests under conditions varying from drought to excessive rainfall included clipping the silks and tips of the husks of the ears and applications to the corn silks of mineral oil alone and combined with a pyrethrum extract and a derris extract. The results of this work indicate that

under conditions similar to those under which the experiments were conducted, a single application of a 1:5 mixture of prethrum extract and mineral oil might be expected to give satisfactory control of all three pests, and that two applications might give even better control, especially under conditions where heavy infestations of corn earworm and fall armyworm occur. It is pointed out that these methods cannot be expected to control fall armyworms that enter the ears directly through the husks on the sides or at the base of the ears, but the proportion of ears so infested has been found to be of little consequence except possibly under the conditions of unusually high infestation. The application of the results of these experiments is considered to have made it possible for Puerto Rican farmers to profitably supply the New York market with high-quality, fresh, green sweet corn during the winter months. It is estimated that such sweet corn could be produced at a cost of approximately 0.9 ct. per dozen ears for one application, or 1.8 ct. per dozen ears for two applications.

Summary of results of experiments in controlling corn ear pests in Puerto Rico. W. K. BAILEY. (P. R. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 763-769, figs. 4).—A summary of the experiments noted above.

Insect pests of the kurrajong. E. H. ZECK (*Agr. Gaz. N. S. Wales*, 51 (1940), No. 12, pp. 679-681, figs. 6).

Some insect-enemies of *Pithecolobium* and *Parkia* [trans. title], P. VAN DER GOOT (*Landbouw [Buitenzorg]*, 16 (1940), No. 9, pp. 503-515, pls. 3; *Eng. abs.*, pp. 511-512).—This account relates to insect pests that may cause considerable damage of seeds of djengkol (*Pithecolobium lobatum*) and petéh (*Parkia speciosa*) which when full-grown are used as food by the native population of West Java. The more important are the djengkol weevil *Trypsetus incarnatus* Gyll., the djengkol pod borer *Argyroplote illepiida* Butl., and the petéh pod borer *Mussidia pectinicornella* Hamp.

Recommendations for the control of tobacco insects for the season 1941 ([*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*], 1941, pp. [1]+II+25).

[Contributions on fruit insects] (*Better Fruit*, 35 (1941), No. 8, pp. 3-5, 7, 19-22).—The contributions here presented include Newest Developments in Orchard Pest Control, by R. L. Webster (pp. 3, 20-22) (*Wash. Expt. Sta.*); and Prune Thrips Controlled by Properly-Timed Sprays, by S. C. Jones and D. C. Mote (pp. 4, 19), Cherry Fruit Fly Control Related, by S. C. Jones (p. 5), and Early Dusting Need to Check Spit Bugs, by D. C. Mote (p. 7) (all *Oreg. State Col.*).

Insects from seed pods of the primrose willow (*Jussiaea angustifolia*), J. G. NEEDHAM (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 1, pp. 2-6, figs. 6).—An account is given of insects found on the primrose willow, an annual weed commonly found growing in the wet soil in the bottom or roadside ditches in Puerto Rico.

The forest insects of Quebec in 1940 [trans. title], R. LAMBERT (*Québec Min. Terres et Forêts, Chasse et Pêche, Serv. Ent., Contrib.* 10 (1941), pp. 38, figs. 9).—A summary of the results of work in 1940.

Insecticides (In *Seventeenth Annual Cumberland-Shenandoah Fruit Conference*, Martinsburg, W. Va., Nov. 22-23, 1940, pp. 9-14).—This part of the report of the committee on insects and diseases deals with the proceedings of the conference in relation to tests of materials for control of the codling moth, rosy apple aphid, European red mite, pistol casebearer, Comstock's mealybug, plum curculio, red mite, terrapin scale, and the peach tree borer.

Insect repellents, M. A. LESSER (*Drug and Cosmetic Indus.*, 48 (1941), No. 2, pp. 149-151, 165).

A Chinese insecticidal plant (*Tripterygium wilfordii*) introduced into the United States, W. T. SWINGLE, H. L. HALLER, E. H. SIEGLER, and M. C. SWINGLE. (U. S. D. A.). (*Science*, 93 (1941), No. 2403, pp. 60-61).—The plant *T. wilfordii*, rather widely cultivated in several Chinese provinces on the south side of the Yangtze River, was secured in the autumn of 1935 and introduced into the United States, where it was grown at the U. S. D. A. Plant Introduction Garden at Glenn Dale, Md. The powdered root was tested against larvae of the codling moth by the apple plug method. Used at the rate of 2 lb. per 50 gal. of solution about 60 percent of clean fruit was obtained. An alcoholic extract of the fresh root used at the rate of 2 lb. of extractives per 50 gal. of solution gave 90 percent of clean fruit. It was found very toxic to first-instar larvae of the diamondback moth and the imported cabbageworm. The material caused relatively low mortalities and in some instances practically none on first-instar larvae of the southern armyworm, second and larger instars of the melonworm, and large larvae of the southern beet webworm, but alcoholic extracts gave slightly better results. The material was very repellent to small larvae which attack Cruciferae but was much less effective than derris on larger ones. The results obtained are considered sufficiently promising to warrant a detailed chemical study of the plant extractive.

Tests for toxicity of arsenicals and sodium fluoride to the American roach *Periplaneta americana*, L., H. L. SWEETMAN. (Mass. State Col.). (*Canad. Ent.*, 73 (1941), No. 2, pp. 31-34).—Description is given of a method for testing the toxicity of contact poisons by sealing the mouth parts of American cockroaches to prevent swallowing of any of the toxic substances. A method for testing toxicity through the digestive tracts of poisons that normally are avoided is also described in which the insects were force fed. Three arsenicals and sodium fluoride killed the roaches by contact action. Sodium fluoride definitely acts as a stomach poison after being taken in by mouth.

A revision of the grasshoppers of the genus *Orphulella* Giglio-Tos from America north of Mexico (Orthoptera: Acrididae), A. B. GURNEY. (U. S. D. A.). (*Ent. Amer.*, 20 (1940), No. 3, pp. 85-157, figs. 67).—In this revision of the genus *Orphulella* four species and two subspecies are recognized by the author as occurring in the United States and Canada. A seven-page list of references to the literature cited is included.

Ecological distribution of Acrididae in central Oklahoma, C. C. SMITH (*Okla. Acad. Sci. Proc.*, 20 (1940), pp. 67-69).

A new Isoneurothrips from New Zealand (Thysanoptera: Thripidae), J. C. CRAWFORD. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 3, pp. 63-64).—A species of thrips reported to be doing considerable damage to the blossoms of grapes in a restricted area in the Auckland district of New Zealand is described as new under the name *I. obscuratus*.

Biological studies of *Ornithocoris toledoi* Pinto, the Brazilian chicken bedbug, B. T. SNIPES, J. C. M. CARVALHO, and O. E. TAUBER (*Iowa State Col. Jour. Sci.*, 15 (1940), No. 1, pp. 27-37, pl. 1, figs. 3).—This contribution reports preliminary studies on the biology of *O. toledoi*, a serious pest of chickens in the States of São Paulo and Minas Geraes, Brazil. Under experimental conditions this insect also fed on turkeys, ducks, and pigeons, but did not attack man. Data reported include description of the egg, nymphs, and adults; feeding habits; mating; deposition; incubation time; and duration of stadium.

Final report on the scheme of investigation on the white-fly of cotton in the Punjab, M. A. HUMAIN and K. N. TREHAN (*Indian Jour. Agr. Sci.*, 10 (1940), No. 2, pp. 101-109).—The results of a 5-yr. study of the biology of *Bemisia gossypiperda* and a method of control through use of insecticides which has been worked out on a field scale are reported upon.

Hot air treating machines used in the ginneries for the destruction of pink boll worm in the cotton seed, MOHAMMED FOUAD EL GAMMAL (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 150 (1940), pp. [1]+20, pls. 40).

The importance and use of parasites in the control of oriental fruit moth, C. WINGO. (Univ. Mo.). (*Missouri Acad. Sci. Proc.*, 5 (1940), No. 4, pp. 122-124).—The introduction into Missouri of *Macrocentrus ancylovora* Roh., a larval parasite of the oriental fruit moth, led to its recovery in every county but one in which it was released, and in 1938 a parasitization of 28.4 percent for the State was recorded. Some localities reported parasitization as high as 54 percent, 76 percent of which were *M. ancylovora*. In 1937 15 percent of the second-brood oriental fruit moth larvae in two orchards in St. Louis County were found to be infested with the native parasite *Eubadizon pleurale* Cress. In 1938 there was a locality in Cape Girardeau County in which the total parasitization was 34 percent, 85 percent of which were *E. pleurale*. *Glypta ruftscutellaris* Cress., found to parasitize as high as 6 percent of the larvae in some localities, was the only other native parasite recorded generally as present in at all important numbers.

The Hippelates flies or eye gnats.—Preliminary notes, C. W. SABROSKY. (Mich. State Col.). (*Canad. Ent.*, 73 (1941), No. 2, pp. 23-27).—A provisional key is given to the *Hippelates* flies of the United States, and descriptions of five new species.

A preliminary list of the Chironomidae (midges) of Missouri, C. F. ADAMS (*Missouri Acad. Sci. Proc.*, 5 (1940), No. 4, pp. 124-127).

A dipterous parasite (*Myopa* sp.) of the honeybee, C. A. JAMILSON (*Sci. Agr.*, 21 (1941), No. 5, p. 244).—The author reports the discovery of a dipterous larva in the abdomen of a worker honeybee foraging sweetclover blossoms at Ottawa, Canada, it being identified as a conopid of the genus *Myopa*. The larvae of this genus are known to parasitize species of *Vespa*, *Andrena*, *Bombus*, *Eucera*, and *Colletes*.

Studies on *Oestrus ovis* L., A. M. FALLIS (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. D, pp. 442-446, pls. 2).—Report is made of a study of the habits and development of the three larval stages of the sheep botfly in lambs. Information relative to the rate of growth of the larvae was obtained from a routine examination of infected animals and experimental infection of lambs, and the effect of the parasites on the experimentally infected animals was noted.

Preliminary observations on the bionomics of the goat warble fly *Hypoderma crossii* Patton, B. N. SONI (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 3, pp. 280-283, pl. 1, fig. 1).—Report is made of observations by the author on the bionomics of *H. crossii* in northwest India.

The occurrence of larvae of the stable fly *Muscina stabulans* (Zett.) in living nymphs of the grasshopper *Xanthippus corallipes pantherinus* (Sc.), H. KNOTSON (*Jour. Parasitol.*, 27 (1941), No. 1, pp. 90-91).—The finding of larvae of the false stablefly to occur within living nymphs of *X. corallipes pantherinus* and observation of its penetration in the laboratory of weakened nymphs of two other grasshoppers (*Encoptolophus sordidus costalis* (Sc.) and *Chortophaga viridifasciata* (DeG.)) by the larvae are reported. The number

cf maggots in a nymph varied from 1 to 18, with a mean of 8. Support is thus given to the view that the fly is, under certain conditions, actually parasitic, possibly entering the host as a larva, and may represent a transitional stage in the evolution of parasitism.

The horn fly and its control, W. G. BRUCE (*U. S. Dept. Agr. Leaflet 205* (1940), pp. [1]+ 5, figs. 3).—A practical account, including its damage, seasonal activities, life history, and habits and control.

Studies of the physiology and toxicology of blowflies, II-VII (*Austral. Council Sci. and Indus. Res. Pams. 101* (1940), pp. 131, figs. 24; *102* (1940), pp. 67, figs. 5).—Further studies on the physiology and toxicology of blowflies (*E. S. R.*, 81, p. 820) include the following:

No. 101.—II, The Action of Stomach Larvicides on *Lucilia cuprina*, by F. G. LENNOX (pp. 9-49); III, The Toxicity of Some Arsenicals to Larvae of *Lucilia cuprina*, by F. G. LENNOX and L. G. WEBBER (pp. 51-67); and IV, The Action of Contact Larvicides on *Lucilia cuprina*, by F. G. LENNOX (pp. 69-131).

No. 102.—V, The Hydrogen Ion Concentration in the Alimentary Canal, by D. F. WATERHOUSE (pp. 7-27); VI, The Absorption and Distribution of Iron, by D. F. WATERHOUSE (pp. 28-50); and VII, A Quantitative Examination of the Iron Content of *Lucilia cuprina*, by F. G. LENNOX (pp. 51-67).

The screw-worm fly, D. D. McLEAN (*Calif. Conserv.*, 6 (1941), No. 2, pp. 11, 20, 21).—A report on the infections and outbreaks caused by this seasonal destroyer of game animals and livestock, together with recommendations for control.

Contribution to a bibliography of fruitflies [trans. title], K. J. HAYWARD (*Bol. Estac. Eapt. Agr. Tucumán*, No. 31 (1940), pp. 42).

A new pest, *Acanthiophilus helianthi* Rossi (Trypetidae), of safflower in India, H. S. PRUTHI and H. L. BEATA (*Indian Jour. Agr. Sci.*, 10 (1940), No. 2, pp. 110-118, pl. 1).—The trypetid dipteran *A. helianthi*, which infests the buds of the safflower (*Carthamus tinctorius*), a plant from which dyes are obtained from its flowers and oils from its seeds, is said to have become a serious pest of the plant in India. Notes are given on its life history and habits and its parasites and predators and a description of its stages.

Some fleabeetles injurious to beans in tropical America (genus *Diphaulaca*, family Chrysomelidae), H. S. BARBER (*U. S. D. A.*). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 3, pp. 65-68).—The genera *Diphaltica* and *Hornaltica* are erected and three species described as new, namely, *Diphaulaca cordobae* from several localities in Mexico, where it seriously injures frijoles, *D. panamae* from pole beans in Panama and red kidney beans in Colombia, and *D. meridae* from Venezuela and Trinidad. Notes on seven additional forms on beans in tropical America and a key for the separation of the forms considered are included.

Further studies of conditions influencing the survival of Japanese beetles through metamorphosis, D. LUDWIG and H. FOX (*Jour. N. Y. Ent. Soc.*, 49 (1941), No. 1, pp. 65-75).—This further contribution (*E. S. R.*, 81, p. 685) reports the results of three later series of experiments, the first two on larvae reared at 25° C. in a medium composed either exclusively or in part of *Carex* mold and the third on others kept at 27.5° in a mixture of soil and *Andropogon* mold. "Larvae were reared at 25° in *Carex* mold to which grains of wheat were added for different periods of time during larval development. The addition of wheat for only a 5-day period during early larval life improved the medium to such an extent that a few individuals were able to complete de-

velopment and metamorphosis, whereas in *Carex* alone all larvae died during the first, second, or early part of the third instar. The maximal beneficial effects of wheat were obtained when it was fed throughout the first two instars and during 10 to 50 days of the third instar. If continued beyond this time there was a high mortality among larvae approaching metamorphosis. These toxic effects of wheat are partially counteracted at 25° by the presence of soil in the basic medium. It is suggested that these toxic effects are due to the decomposition products of wheat grains, since they are not evident when wheat is fed throughout larval life but all old wheat removed each time fresh wheat is added, or when presence of wheat alternates with its absence. Larvae reared at 27.5° in *Andropogon* mold and soil to which wheat grains were added throughout the larval period did not survive pupation. However, when the wheat was removed after the larvae had passed 30 days of the third instar, 23.7 percent of those surviving 70 days of this stage metamorphosed. At this temperature, which in itself is apparently detrimental to metamorphosing larvae, the toxic effects of wheat were not counteracted by the presence of soil. Hence, the reactions of the larvae to a food combination appear to be conditioned by temperature."

Mortality among hibernating larvae of the Japanese beetle, with special reference to conditions in the winter of 1935-36, I. M. HAWLEY and T. N. DOBBINS. (U. S. D. A.). (Jour. N. Y. Ent. Soc., 49 (1941), No. 1, pp. 47-56, fig. 1).—Information gained from larval surveys indicated that prior to 1936 the mortality among hibernating larvae of the Japanese beetle was negligible in the area then infested. The available information pointed to 15° F. (−9.4° C.) as the lowest temperature which could be withstood by hibernating larvae under natural conditions. Continuous soil temperature records at Moorestown, N. J., since 1925 indicate that only occasionally, during periods of severe weather, have temperatures at the 3-in. level fallen appreciably below 30°. This has been due largely to the insulation afforded by snow cover during such periods. A heavy mortality among overwintering Japanese beetle larvae was evident in 1936 after a severe cold period, although soil temperatures at Moorestown were not as low in 1934, a year with no unusual amount of mortality. A critical comparison of meteorological data for 1934 and 1936 indicates that in the latter year, in all probability, mortality was occasioned by a complex of factors which involved moisture as well as low temperature.

The relationship between hardness of sugar cane and varietal resistance to the beetle borer *Rhabdocnemis obscura* Boisid., J. H. BUZACOTT (Queensland Bur. Sugar Expt. Stas. Tech. Commun. 8 (1940), pp. [21] + 127-152, figs. 15).—While the New Guinea sugarcane weevil can pass through its life history in both hard and soft varieties of sugarcane, the larval period appears to be extended in hard canes and fewer eggs are laid in them. "Rind hardness, so-called, is not due to hardness of the rind but to the number, form, and arrangement of peripheral vascular bundles. The term 'hardness' is therefore to be preferred to 'rind hardness.' Hardness appears to be closely related to the fiber content of the cane. Preliminary work indicates that the introduction of a hard parent into a cross increases the average hardness of the progeny. Artificial trashing of sugarcane does not increase its hardness but does reduce the borer infestation therein. A natural corollary is that self-trashing varieties are more resistant to borers than those which are not self-trashers. Varietal resistance to borers is influenced by factors other than hardness alone. Cane stalks affected with top rot carry higher borer populations and are much

softer than healthy stalks of the same variety grown under the same conditions. The principal factors contributing to borer resistance in a variety are hardness (with its related fiber), self-trashing, erectness of habit, and resistance to top rot. If other factors are given due consideration it is possible by means of hardness readings to forecast the reaction of a variety toward borers."

On the occurrence of the weevil *Naupactus leucoloma* Boh. in Australia, C. R. WALLACE (*Jour. Austral. Inst. Agr. Sci.*, 6 (1940), No. 4, pp. 209-211).—A brief account is given of the white-fringed beetle, first reported from New South Wales in 1933, as found attacking alfalfa. Observations of its seasonal behavior are briefly summarized.

A new Philippine cucurbit-boring barid (Coleoptera: Curculionidae), E. C. ZIMMERMAN (*Philippine Jour. Sci.*, 73 (1940), No. 3, pp. 313-319, fig. 1).—Description is given of a weevil, *Manilabaris cucurbitae* n. gen. and sp., from Manila. This has been found by A. Ponce to be a serious pest of patola (*Luffa* sp.), ampalaya or bitter melon (*Momordica charantia*), and upo or white squash (*Lagenaria siceraria*).

Wheat weevils and their control: A summary of existing information, F. N. RATCLIFFE, F. J. GAY, and J. S. FITZGERALD (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 229-239).

[Apicultural investigations by the Wyoming Station.] (Partly coop. U. S. D. A.). (*Wyoming Sta. Rpt. 1940*, pp. 19-22).—Information is summarized on breeding bees for resistance to disease, and the work of the Intermountain States Bee Culture Field Laboratory.

A discussion of the natural history, management, and diseases of the honey bee, E. OETTEL (*Baton Rouge: La. State Dept. Agr. and Immig.*, 1940, pp. 43, [figs. 4]).

Susceptibility of honeybee larvae to American foulbrood, A. W. WOODBOW. (U. S. D. A. and Ark., Iowa, Tex., Wis., and Wyo. Expt. Stas.). (*Gleanings Bee Cult.*, 69 (1941), No. 3, pp. 148-151, 190).—In experiments at Laramie, Wyo., in 1938 and 1939, brood from resistant and nonresistant colonies was equally susceptible to American foulbrood when reared in badly diseased colonies, suggesting that colony resistance depends on behavior factors rather than on physiological resistance in the larvae. "There was no evidence of physiological resistance to the disease in honeybee larvae other than the decrease in susceptibility associated with their age. Brood susceptibility was greatest in the first day of larval life. Susceptibility decreased thereafter to the extent that larvae inoculated more than 2 days 5 hr. after hatching did not become infected. The period of susceptibility corresponds closely with the period of mass feeding of the larvae. The failure of some brood to develop disease when reared under infectious conditions appears to be a result of the short time in larval life when inoculation must occur to produce infection and [of] the type of feeding at that time."

The development of western wheat stem sawfly (*Cephus cinctus* Nort.) in various host plants as an index of resistance, C. FARSTAD. (*Iowa State Col. Jour. Sci.*, 15 (1940), No. 1, pp. 67-69).

A new form of spruce sawfly identified by means of its cytology and parthenogenesis, S. G. SMITH (*Sci. Agr.*, 21 (1941), No. 5, pp. 245-305, figs. 116).—The bionomics of the European spruce sawfly, first discovered in the Gaspé Peninsula in 1930, is outlined and compared with that of the form originally recognized in Europe. The two appeared morphologically similar but differed as follows: (1) In Canada parthenogenesis is obligatory, in Europe it

is facultative; (2) in Canada the cocoons are almost invariably spun in the surface covering, in Europe the lower foliage and the surrounding herbaceous growth are usually preferred; and (3) a varying percentage of the Canadian cocoons remain dormant (diapause) for 1 or several years, in Europe two generations per year are usually produced. These differences suggested a comparative cytological examination to discover an explanation for the difference in parthenogenesis and to establish the identity of the Canadian form. The cytology of parthenogenesis is briefly reviewed, and the cytological technic employed is outlined.

From the evidence presented it is concluded that the European obligatory form and the Canadian form are identical; the latter originated in Canada by introduction; and the obligatory form is less widely distributed in Europe, possibly being absent from some regions in northern Bohemia and Morava (Moravia).

A new spinning mite attacking strawberry on the mid-Atlantic coast, E. A. MCGREGOR. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 2, pp. 26-28, figs. 6).—A mite collected from eight localities in four States, namely, North Carolina, Maryland, and Virginia on strawberries and Idaho on red clover, is described as new under the name *Tetranychus atlanticus*.

ANIMAL PRODUCTION

[Experiments in livestock production by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 70-78, 93-97, 135).—Among investigations reported by C. E. Aubel, J. S. Hughes, L. M. Roderick, A. D. Weber, C. W. McCampbell, R. B. Cathcart, R. F. Cox, L. M. Sloan, H. L. Ibsen, D. L. Mackintosh, J. L. Hall, G. Vail, L. F. Payne, D. C. Warren, H. M. Scott, and L. C. Aicher are the following: Relation of P requirements of swine to variations in the P and vitamin D consumed; comparison of tankage, fish meal, soybean products, cottonseed meal, and alfalfa hay and meal as protein supplements for swine; sorgo silage, powdered limestone, and protein supplements for steers; comparison of heavyweight and lightweight yearling calves; utilizing native pastures for steers and heifers; limestone and protein supplements for lambs; utilization of sorghums, wheat pasture, alfalfa hay and straw, and beet products by lambs; the effects of inbreeding and line breeding on body weight, rate of growth, breeding performance, and other characteristics of sheep; factors which influence the quality and palatability of beef and the processing of pork for storage in freezer lockers; effect of Ca and low-P rations on meat production and fattening of cattle; range crops and grass silage for growing chicks and laying hens; use of artificial insemination for developing a more critical progeny test for poultry; and restricted feed consumption and value of grass pasture for turkey production.

[Investigations in animal production by the South Carolina Station] (*South Carolina Sta. Rpt. 1940*, pp. 77-78, 90-92, 98-104).—Results are presented of the following investigations by L. V. Starkey, E. G. Godbey, R. C. Ringrose, C. L. Morgan, E. D. Kyzer, R. L. Jones, and J. H. Mitchell: Berkshire contrasted with Duroc-Jersey \times Berkshire pigs, the effect of the ration upon the rate and cost of gains and the quality of beef produced; the balance between intake and outgo of Ca in the nutrition of the hen; the nutritive value of lespedeza for poultry feeding; menhaden fishmeal, sardine meal, tankage, and meat and bone scrap as protein supplements for fattening hogs; creep feeding v. noncreep feeding for the production of beef calves for slaughter and breeding

purposes; sorghum silage v. rye pasture for wintering stocker steers; and beef-producing capacities of fertilized Coastal Plains pastures.

[Experiments in breeding, feeding, and management of livestock by the Wyoming Station]. (Partly coop. U. S. D. A.). (*Wyoming Sta. Rpt. 1940*, pp. 11-12, 14-15, 26-27, 42-43).—There are included results of investigations on breeding Corriedale sheep, rye in the ration of laying hens, effect of rations on the palatability of turkey meat, value of cotton coats (rugs) for sheep, fleece quality of Australian Merino rams \times Rambouillet ewes, effect of shrinkage and grade upon value of individual fleeces, irrigated alfalfa pasture for lamb and pork production, beet byproducts for fattening livestock, and sexing chicks and housing poultry.

[Practical results in animal production studies by the Wyoming State experiment farms] (*Wyoming Sta. Bul. 243 (1941)*, pp. 11, 14-15, 19, 24-25, 34-35, 37-38, 41-43, figs. 2).—There are included brief results of tests on the following studies: Pasturing a poor corn crop with lambs; grinding alfalfa for lambs; feeding lambs ground and unground Russian-thistles; skim milk as a replacement for grain in pork production; pasturing alfalfa, sweetclover, and Sudan grass with lambs and pigs; feeding corn silage to steers; comparison of cottonseed cake with phosphate salt mixtures for lambs; sexing chicks not profitable; and self-feeding lambs.

Free fatty acids and rancidity in relation to animal by-product protein concentrates, R. E. GRAY and H. E. ROBINSON (*Poultry Sci.*, 20 (1941), No. 1, pp. 36-41).—Although lots of from 20 to 40 chicks each were fed on well-balanced rations with meat scrap containing high and low free fatty acid, which showed wide variation in the peroxide values, there was little apparent and no significant difference in the effect on growth and mortality to 6 weeks of age. Fat rancidity of the meat scrap did not increase the appearance of vitamin A deficiency symptoms up to 10 weeks of age on rations containing the same amounts of vitamin A.

The supplementary effect of cystine and methionine upon the protein of raw and cooked soybeans as determined with chicks and rats, J. W. HAYWARD and F. H. HAFNER (*Poultry Sci.*, 20 (1941), No. 2, pp. 139-150).—In a series of experiments the protein of raw soybeans was effectively supplemented with small amounts of cystine and methionine or by autoclaving. When either of these amino acids was added to a ration with autoclaved soybeans, more efficient utilization of the protein was obtained. From an analysis of the results it appeared that the protein of raw soybeans was deficient in available cystine and that it contained suboptimal amounts of methionine. There was a suggestion that autoclaving the soybeans possibly increased the availability of other protein constituents essential for growth. Although different rations were used with the rats and chickens, essentially the same results were obtained in both sets of experiments.

Mineral hunger in livestock, R. H. LUSH (*Natl. Fert. Assoc. Pam. 129 [1940]*, pp. 15, figs. 22).—A comparison of symptoms and characteristics of mineral deficiencies in livestock.

Low calcium rickets in the guinea pig, P. R. HOWE, L. G. WESSON, P. E. BOYLE, and S. B. WOLBACH (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 298-301, figs. 2).—Irregular vascular penetration and masses of osteoid tissue characteristic of rickets were observed in guinea pigs on a low-Ca and low-vitamin D diet. Irregularity in the calcification of the dentine and the wide inner margin of the incisor teeth as characteristic of rickets also occurred. These findings thus show that rickets may be produced in the guinea pig by a low-Ca and low-vitamin D ration.

Planning the cattle feeding program, R. BERESFORD (*Iowa Sta. Bul. P20, n. ser. (1941), pp. 597-618, figs. 8*).—A discussion of success to be expected from feeding practices with different grades of cattle and feeds.

The relative efficiency of spayed, open, and bred heifers in the feed lot, G. H. HART, H. R. GUILBERT, and H. H. COLE (*California Sta. Bul. 645 (1940), pp. 19*).—Contrary to the results with rats (*E. S. R., 80, p. 608*), no advantages in feed consumption, gains, or dressing percentages were shown by spayed and bred heifers going into the feed lot. Both trials with approximately 40 head in each showed that although the pregnant heifers gained slightly more rapidly than the others, due to the increase in weight of the gravid uterus, there was no compensatory gain in feed consumption, efficiency, or quality of the product.

Calcium in the nutrition of the fattening calf, A. D. WEBER, C. W. McCAMPBELL, J. S. HUGHES, and W. J. PETERSON (*Kansas Sta. Tech. Bul. 51 (1940), pp. 91, figs. 17*).—Additions of 0.1 lb. of limestone daily per head to a basal ration of ground shelled corn, sorgo silage, and cottonseed meal, which contained 11, 7.2, and 8.9 gm. of calcium, respectively, produced increased gains in weight; more efficient utilization of feed; increased retention of calcium and phosphorus; higher slaughter grades; and heavier bones of higher specific gravity, greater breaking strength, and higher ash content in the steers than rations to which no supplements were added. However, the additional limestone had no significant effect on appetite; thirst; digestibility of nutrients; dressing percentage; carcass grade; weights of heart, liver, and spleen; and calcium, phosphorus, and hemoglobin content of the blood. The conclusions were derived from three experiments in two of which 24 steers were individually fed in pairs and in the third of which two groups of 10 steers each were lot fed. Detailed data are given on body weights and gains; body measurements; feed consumption, composition, and utilization; and dressing percentages. Three pairs of steers were selected at the conclusion of the second trial which showed that those with calcium supplements did not digest the nutrients any better than steers on the low-calcium ration. At the same time it was noted that the steers receiving calcium supplements required less feed per 100 lb. of gain than those on the low-calcium rations.

A quantitative study of vitamins in the rumen contents of sheep and cows fed vitamin-low diets, I, II, L. W. McELROY and H. GOSS. (*Univ. Calif. Jour. Nutr., 20 (1940), No. 6, pp. 527-540, figs. 4; pp. 541-550, figs. 2*).—Papers on the riboflavin, vitamin K, and vitamin B₆ of the dried rumen contents of cows and sheep and the milk produced by the cows on rations relatively free from these substances are presented.

I. *Riboflavin and vitamin K*.—In assay experiments with chicks, the dried rumen contents of four sheep were found to average 33 μ g. of riboflavin per gram, although the ration fed to the sheep for 33 days before slaughter furnished only 0.3 μ g. of riboflavin per gram. The rumen contents removed by siphon from a cow on a similar ration contained an average of 25 μ g. of riboflavin per gram. Acidification of the rumen contents before drying seemed to preserve the riboflavin better than was possible without acidification. Dried skim milk from the cow was found on assay to contain at least 20 μ g. per gram. Assays by methods of Almquist and Klose (*E. S. R., 82, p. 88*) showed the rumen contents of the cows to be about one-sixth as potent a source of vitamin K as dried alfalfa, and demonstrated that a relatively large amount of vitamin K, as well as riboflavin, was synthesized in the rumen.

II. *Vitamin B₆ (pyridoxine)*.—The rumen contents of the sheep and cows in the above experiment and the rations fed were assayed for the presence of vitamin B₆ by methods of Dimick and Schreffler (*E. S. R., 82, p. 710*), using a

basal diet including glucose, casein, cottonseed oil, and fish oil with rats. The results showed the sheep ration to contain a small amount of vitamin B₆, but this vitamin was also synthesized in the rumen since the ratio of that present to the ration was about 6 or 8 to 1. The milk from the depleted cows was found to be comparable to that of normal concentrated milk. In conducting the experiment, the rats were first depleted for 7 weeks, and then diets were supplemented with the substances in question.

A scoring system for sheep breeders, F. S. HULTZ. (Univ. Wyo.). (*South-west. Sheep and Goat Raiser*, 11 (1940), No. 3, pp. 35-37, figs. 2).—A description is given of the system of evaluating the carcass and wool of sheep in the sheep breeding project of the station.

Comparison of two methods of determining wool density, M. A. MADSEN, R. W. PHILLIPS, J. V. CHRISTENSEN, and R. L. HENRIE (*Utah Sta. Bul.* 295 (1941), pp. 16, figs. 3).—Comparison was made by methods of variance analysis of the results obtained by determining wool density through first clipping a small area of a predetermined size and a larger area that was measured after the removal of the sample. The results indicated that both methods gave fairly accurate results, but when used on different areas of the sheep they were more consistent when the small area of predetermined size served as the basis. Wrinkling of the skin also seemed less likely to distort the estimates. On the other hand, more consistent results were obtained from clipping the larger sample because smaller differences were needed to indicate a significant difference between sheep, locations, or observers. Further work seemed necessary to improve the technics.

Preliminary observations on Spotted Poland China as compared with black Poland China, Duroc-Jersey, and Berkshire pigs, A. I. MALLARI and E. C. FARINAS (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 5, pp. 439-447).—Spotted Poland China swine were the most prolific of the four breeds studied, but this breed also showed the greatest mortality at 2 weeks and 4 mo. of age and did not produce superior crosses with other breeds. These results were based on records of 498 litters at the Philippine Bureau of Animal Industry from 1931 to 1939.

Manganese as a possible factor influencing the occurrence of lameness in pigs, R. C. MILLER, T. B. KEITH, M. A. MCCARTY, and W. T. S. THORP. (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 50-51).—Stiffness, enlarged hock joints, and crooked legs were exhibited when a weight of 150 lb. was attained by 30 of 60 pigs fed on yellow corn, tankage, soybean meal, ground alfalfa hay, and salt. The condition was prevented by supplements of MgSO₄, but Mg was ineffective in curing stiffness after it had developed. The condition was not alleviated by cod-liver oil, Ca, P, or irradiated yeast supplements, although it resembled rickets.

Regional conferences on the National Poultry Improvement Plan, June 1940 (*U. S. Dept. Agr., Bur. Anim. Indus.*, pp. [2]+103, fig. 1).—A report and discussion of the program presented at the five regional conferences held in June 1940 under the National Poultry Improvement Plan.

[Experiments in poultry production by the Delaware Station]. (Partly coop. U. S. D. A. et al.). (*Delaware Sta. Bul.* 227 (1940), pp. 14-18, fig. 1).—Results are briefly reported as to work by A. E. Tomhave, W. C. Skoglund, and G. L. Baker on breeding for egg production with special reference to the method of selection of the breeding males, the protein levels of growing rations in relation to the feathering and growth of pullets, hatchability and feathering in Barred Rock strains used in producing broiler chicks, negative effect of nickel pectinate and pure pectin in increasing rate of growth of chicks, and artificial

lights as an aid in maintaining egg size during the summer months and the average price received per dozen of eggs.

Home-mixed rations for poultry, H. J. DAVIS and J. B. FRANCONI, JR. (*Louisiana Sta. Bul.* 330 (1941), pp. [4]).—Ingredients and costs of feeds in several home-mixed and commercial rations for poultry are presented.

Mill run in the breeders' mash, G. E. BEARSE. (West. Wash. Expt. Sta.). (*Northwest. Miller*, 205 (1941), No. 13, p. 31).—Replacement in the rations of laying hens of as much as 50 percent of the mash by standard mill run did not seriously interfere with egg-producing ability of the hens or mortality of the chicks. However, replacement of 35 percent of the ration with mill run gave slightly better results, and both replacements proved superior to the feeding of 20 percent of mill run in the mash. These experiments were conducted with two groups of birds handled slightly differently during their molting and resting periods and with four lots of fowls in each case.

Composition and quantity of feed consumed by laying hens versus composition and quantity of body fat and eggs produced, G. D. BUCKNER, W. M. INSKO, JR., and A. HAHMS. (Ky. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 121-124).—Even though the average amounts and compositions of feed consumed by hens in four lots varied widely during 18 weeks, the average weight of the eggs, dried shells, whites, wet yolks, dried yolks, and dried fats in the eggs were approximately the same per pound of feed consumed. However, more fat was found in the body of the hens receiving the larger percentages of starch. These studies were based on 36 1-year-old Rhode Island Red hens on rations containing varying amounts of different cereals and distillers' corn dried grains.

Carbohydrate metabolism of the chick embryo, A. J. DALTON and R. F. HANZAL (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 278-281).—Continuing these studies,^{*} investigations of the effects of endocrine extracts on carbohydrate metabolism of chick embryos showed that suprarenal cortical extract caused an increase in the blood sugar level and a decrease in liver glycogen of 8-day-old embryos. Crude anterior lobe extract produced an increase in both. Thyroxine and suprarenal cortical extract induced glycogenolysis in the liver, and glucose failed to interrupt the normal disappearance of glycogen in 12-day-old embryos. Injections of adrenalin had no effect on liver glycogen, nor did raising the blood sugar above normal increase the percentage of liver glycogen. In conducting the studies, the various extracts were injected through the shell membrane under the chorioallantois.

Vitamin B₆ and chick nutrition, A. G. HOGAN, L. R. RICHARDSON, H. PATRICK, B. L. O'DELL, and H. L. KEMPSTER. (Mo. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 180-183, figs. 3).—Difficulties with synthetic rations for studying anemia, dermatitis, and perosis in the chick were corrected by increasing the growth rate by supplementing these rations with vitamin B₆. The results suggested that the optimum amount of the vitamin for baby chicks ranged between 300 and 500 μ g. per 100 gm. of feed consumed. Symptoms of anemia, dermatitis, and perosis, respectively, were successfully produced on the experimental rations prepared to bring about these conditions after increasing the growth rate by supplementing the rations with vitamin B₆.

Adsorbing charcoals in chick diets, H. J. ALMQUIST and D. ZANDER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 303-305).—Since the vitamin K-deficient chick cannot remove vitamin K adsorbed on charcoal, study was made of the effects on health and growth of charcoal fed with a normal diet for baby chicks. The results in five such experiments in

^{*} *Anat. Rec.*, 70 (1937), No. 1, Sup. 1, p. 33.

which the rations supplied adequate but not excessive amounts of necessary vitamins showed that when charcoal was fed there were observed vitamin A and K deficiencies, gizzard erosion, and curled-toe paralysis. Without charcoal, the abnormal conditions did not appear with these rations, thus the adsorbing power of charcoal in poultry rations may not necessarily be completely beneficial.

Effects of choline, gelatin, and creatine on perosis in chicks, T. H. JUKES. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 155-157).—Chicks on a simplified ration deficient in choline did not develop perosis as did turkeys (E. S. R., 84, p. 803) unless gelatin or creatine was added. Levels of 0.1 percent of choline prevented perosis, but lower levels were only partially effective. It seems that the tension exerted on the bones by the muscles plays a part in causing the characteristic bone distortion.

Physical measurements of carcass quality in roasters, R. L. DOLECEK, W. O. WILSON, and W. E. POLEY. (S. Dak. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 161-170, figs. 5).—In further studies of the physical measurements of roasters in relation to carcass quality (E. S. R., 84, p. 802), the authors found significant correlations to exist between the dressed weights and grade, calculated breast volume and weight of the total edible meat, and fleshing index calculated from the carcasses of dressed birds and total edible meat. In a detailed study of the live and carcass measurements of 64 Rhode Island Red roasters killed at 31 weeks of age, significant correlations were obtained between the live and dressed carcass measurements, but it is suggested that the amount of dressed carcass fleshing and the fat content of the edible portion as determined from physical measurements, as well as dressed weight, should be considered in a tentative grading system for the use of research workers. Two nomograms for calculating and correcting grade indexes are described.

Eggs and egg products: A publication by poultry and egg specialists of the United States Department of Agriculture, edited by R. E. MILLER (*U. S. Dept. Agr. Cir.* 583 (1941), pp. 91, figs. 36).—A summary of the uses, marketing, and methods of storage and handling of eggs and their products.

Effect of fresh cereal grass on interior quality of eggs, C. A. DENTON and H. W. TRTUS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 188-192).—The interior quality of the eggs of the three groups of Rhode Island Reds which received supplements of dried frozen grass, thawed frozen grass, or no grass tended to decrease during the course of a study from September 15 to May 18. Feeding the thawed frozen grass as a supplement increased the quantity of the pigment of the yolk in a more pronounced manner than when the grass was dried. Cereal grass cut and immediately frozen in the Midwest was shipped to Beltsville, Md., and served as the product for these experiments. There was no evidence that the grass had any deleterious effect on the quality of the eggs produced.

Researches on the hatching qualities of eggs, I, II, I. Y. PRITSKER (*Poultry Sci.*, 20 (1941), No. 2, pp. 99-103).—Two studies are reported.

I. Fatty deposits on the shells of duck eggs as affecting their hatchability (pp. 99-101).—Of 1,000 duck eggs with fat deposits on the shells 23.9 percent hatched, whereas among 991 eggs without the deposit 52.8 percent hatched normally. The difference was not reduced by washing the fat from the eggs, suggesting that the deposits are indicative of some more profound disturbance than mechanical stopping of the pores.

II. Disinfection of egg shells under increased pressure within the egg (pp. 102-103).—Increasing the pressure within the egg for disinfection by raising the temperature of the surrounding air resulted in better hatches than when

the surrounding air temperature was decreased. The hatches from eggs so treated in three trials were approximately equal to the hatchability of clean control eggs.

Vitamin D requirements of ducklings, J. C. FRITZ, W. ARCHER, and D. BARKER (*Poultry Sci.*, 20 (1941), No. 2, pp. 151-154).—In further study of the nutritive requirements of ducklings (*El. S. R.*, 82, p. 380), 30 chick units of vitamin D per 100 gm. of feed consumed were found to produce optimum calcification. Thus the vitamin D requirements were about the same as those of chicks. Two tests were conducted over 3-week periods with graded doses of vitamin D supplementing an essentially normal ration in the first and a rachitic diet in the second experiment. Somewhat more severe rickets occurred on the negative control diet in the second than in the first test. Essentially maximum calcification was obtained with 30 units, but better growth was produced with increasing levels up to 80 units of vitamin D per 100 gm. of feed in the first test, which may have been due to additional vitamin A. Symptoms similar to perosis occurred in the second experiment.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Kansas] (*Kansas Sta. Bien. Rpt.* 1939-40, pp. 79-93).—Reports of experiments with dairy cattle include deficiencies of sorghum crops as feed for dairy cows, by F. W. Atkeson, H. E. Bechtel, A. O. Shaw, and J. S. Hughes; the carrying capacity of various temporary pasture crops, the carotene distribution in freshly cut Atlas sorgo, a comparison of various preserving agents in making silage, the total feed consumption of dairy cows when various components of the ration are limited, a comparison of the feeding value of sorgo and Sudan silage, the relative palatability of fresh v. aged sorghum stover and of various cereal plants, the influence of certain nutrient deficiencies on dairy herds, the physiology of udder congestion at freshening time, artificial insemination of dairy cows, and utilization of ground and unground Atlas sorgo grain, all by Atkeson, Bechtel, Shaw, and G. H. Beck; dehydrated cereal grass for calf raising, and raising calves on fat-substituted milk, both by Shaw and Beck; and factors affecting the composition of milk, by W. J. Caulfield, Atkeson, and C. H. Whitnah.

Reports on investigation with dairy products not previously noted include the effect of various feeds and feeding practices on the flavor and of feeding vitamin A and carotene on the flavor and color of milk, factors affecting the accuracy of the Babcock test when applied to milk and cream, the influence of homogenization on the flavor, sediment, and bacterial count of milk, and a survey of ingredients used in Kansas ice cream, all by W. H. Martin, Caulfield, Beck, F. E. Nelson, V. D. Foltz, Whitnah, and F. L. Parsons; and methods of estimating *Escherichia-Aerobacter* organisms in ice cream, by Nelson and Foltz.

[Experiments with dairy cattle and dairy products in South Carolina] (*South Carolina Sta. Rpt.* 1940, pp. 70-71, 82-83, 86-89, 166, figs. 3).—Results are briefly reported for the following lines of investigations: Factors influencing the carotene content of feeds, by J. H. Mitchell, E. J. Lease, D. B. Roderick, and G. W. Wise; the relation of the milk-feeding system to the changes observed in whole milk "sham-fed" to calves, by Wise, P. G. Miller, and G. W. Anderson; the effect of feeding cottonseed meal on the physical and chemical properties of milk, by Miller and Wise; tattooing herd numbers on the udders of dairy cows, by J. P. LaMaster; and proving dairy sires by a cooperative lending plan, by S. L. Cathart.

[Experiments with dairy cattle in Wyoming] (*Wyoming Sta. Rpt. 1940, pp. 12-13, 30*).—Results are briefly reported on the value of beet molasses as a supplement to native hay, cottonseed cake v. dried beet pulp for supplementing native hay for growing dairy heifers, an all-roughage ration v. grain and hay for milking cows, and open sheds v. closed barns for housing the milking herd.

[Dairy investigations at the Wyoming State experiment farms] (*Wyoming Sta. Bul. 243 (1941), pp. 4-5, fig. 1*).—Studies at the Afton Sub-station are briefly discussed under articles entitled Elaborate Housing Does Not Increase Milk Production and Feeding Grain to Cows Decreases Profits.

Estimates of producing ability in dairy cattle, G. E. DICKERSON. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 8, pp. 561-568, figs. 6*).—Selecting only normal healthy cows with at least five lactation records, the lifetime production records of 274 Holsteins from 41 herds were analyzed to determine what adjustments for environmental influences are advisable in selecting for producing ability. A significant increase in repeatability of records resulted from age correction when applied to any of the five kinds of records studied, i. e., 240-day, 305-day, 365-day, total lactation, and testing year. The increase was greatest for the 240- or 305-day records and least for the total lactation records. Correction for calving interval to a 365-day basis increased the repeatability of total lactation records in spite of removing permanent cow differences in calving interval length. Dividing the record by the number of days in the lactation period and the preceding dry period tended to adjust each cow's record to her own average preceding dry period length and more satisfactorily corrected for variation in the interval between calvings, increasing the repeatability significantly. The use of percentage factors for adjusting for preceding dry period length proved undesirable, since its influence varied inversely with the herd production level. Season of calving was a relatively unimportant source of variation. The age-corrected 240- or 305-day lactation records were equal to the age- and calving-interval-corrected 365-day and total lactation records, and superior to the age-corrected testing year in repeatability. The age-corrected 305-day record is considered the most satisfactory for selection purposes.

Influence of the plane of nutrition during the dry period on the subsequent yield of milk and fat [trans. title], F. JARL (*K. Lantbr. Akad. Tidskr., 79 (1940), No. 4, pp. 315-333, fig. 1; Eng. abs., pp. 331-333*).—Experiments were conducted at the animal breeding institute at Wiad, Sweden, in which comparable groups of dairy cows were fed, respectively, a standard maintenance ration and a supermaintenance ration of roughage, concentrates, and minerals during the dry period. When both groups were fed on the basis of their production requirements during the succeeding lactation period, the group fed the poor ration during the dry period exceeded the heavy-fed group in total milk production during the first 26 weeks of lactation. Only in the case of first-calf heifers did heavy feeding before parturition result in a significant increase in later milk production. It is reasoned that since the milking cows were well fed during the late months of lactation the additional amount of nutrients fed during the dry period failed to stimulate milk secretion any more than the plain maintenance ration.

The relation between milk yields and the quantity and composition of the rations fed to controlled herds in the county of Malmöhus [trans. title], J. AXELSSON (*K. Lantbr. Akad. Tidskr., 79 (1940), No. 3, pp. 231-244, figs. 2; Eng. abs., pp. 243-244*).—Based on an analysis of feeding practices among 886 dairy herds, it is shown that with increasing milk yield the proportion of concentrates (mainly oil cakes) fed during the course of a year increased, while the proportion of succulent feeds remained unchanged and that of other feeds

was reduced. The proportion of concentrates had a more positive effect on yield than that of other feeds. Roots and other succulent feeds had a small positive effect, while the effect of straw was negative. There was an obvious limit to the percentage of succulent feeds which could be advantageously fed, and when that limit was exceeded the yield of milk decreased.

Effect of dietary fat on butterfat production of dairy cows [trans. title], B. WENNERSTRÖM (*Biedermanns Zentbl., Abt. B, Tierernähr., 12 (1940), No. 2, pp. 207-216, figs. 3*).—This contribution from the agricultural college at Uppsala, Sweden, presents evidence that the iodine value of the fat content in the ration is inversely related to the butterfat content of the milk and the total quantity of milk fat produced. A variation of 10 units in the iodine number of the dietary fat caused a change of about 0.08 in the percentage of fat in the milk. The nature of the dietary fat had little influence on the total milk yield.

[The nutritive value of artificially dehydrated grass] (*Delaware Sta. Bul. 227 (1940), pp. 18-19*).—Progress reports by A. E. Tomhave and M. W. Goodwin on the concentrate replacement value in the dairy ration and by Goodwin on the protein and carotene content.

Preliminary observations on chemical changes of rumen ingesta with and without urea, M. I. WEGNER, A. N. BOOTH, G. BOHSTEDT, and E. B. HART. (*Wis. Expt. Sta.*). (*Jour. Dairy Sci., 24 (1941), No. 1, pp. 51-56*).—Extending this line of investigation (*E. S. R., 84, p. 663*) to in vivo experiments, samples of the rumen contents of an experimental heifer were removed by way of a fistula at frequent intervals after feeding. When the animal received a basal low-protein ration of mixed grain, corn silage, and timothy hay, it was found that the total nitrogen and crude fiber in the rumen material was distinctly higher than in the ration fed. The total nitrogen reached its highest level about 5 hr. after feeding and the crude fiber content continued to increase slowly up to 15 hr. after feeding, indicating a more or less selective removal of nitrogen-free extract due to break-down by bacteria or bacterial enzymes and its passage out of the rumen. A definite increase in the percentage of protein nitrogen in the rumen ingesta was produced by adding 5 percent urea to the basal ration. Urea nitrogen or ammonia nitrogen, when ingested as 1 to 5 percent of the basal diet, disappeared from the rumen in from 4 to 6 hr.

The passage of carotenoids from food to milk in the cow: The fate of lycopene, A. E. GILLAM and S. K. KON (*Jour. Dairy Res. [London], 11 (1940), No. 3, pp. 266-275*).—To determine whether lycopene, an isomer of carotene, can pass from food into milk in the cow, three individuals were fed tomato puree and the resulting milk fats were separately examined for this pigment. No evidence of the presence of lycopene was detected in the unsaponifiable matter of the butterfat, but the pigment was found in the feces in considerable quantities. No explanation is offered concerning the mechanism by which cows can absorb α - and β -carotene but exclude the very similar isomer. Examination of several colostrum fats gave no evidence of the presence of lycopene, but two small absorption zones above that of β -carotene were observed, possibly due to oxidation products of β -carotene.

The riboflavin content of milk as influenced by diet, P. JOHNSON, L. A. MAYNARD, and J. K. LOOSLE (Cornell Univ.). (*Jour. Dairy Sci., 24 (1941), No. 1, pp. 57-64, fig. 1*).—Riboflavin determinations were made on a large number of milk samples from both cows and goats receiving a wide variety of rations. When cows were transferred from pasture to a ration of natural feeds low in riboflavin, its content in the milk decreased about 25 percent. Increasing the riboflavin content of this ration by adding a molasses-yeast byproduct resulted in only a temporary increase in milk riboflavin. A winter

ration including good-quality hay and acid-grass silage maintained as high a level of riboflavin in the milk as did pasture. Goats fed a riboflavin-free purified diet continued to secrete relatively large amounts of riboflavin in the milk, and the level was not increased by adding the molasses-yeast feed to the ration. The presence or absence of thiamin and other members of the B complex in the purified diet likewise had little effect on the riboflavin content of the milk. In both cows and goats there appeared to be an inverse relationship between milk yield and riboflavin potency of the milk. It is concluded that the riboflavin content of milk can be influenced only to a very limited extent by the diet.

[Magnesium requirements of calves] (*Michigan Sta. [Bien.] Rpt. 1939-40, p. 14*).—A progress report.

A study of the mortality rates of calves in 335 herds in England and Wales (together with some limited observations for Scotland), R. LOVELL and A. B. HILL (*Jour. Dairy Res. [London], 11 (1940), No. 3, pp. 225-242*).—Data gathered in England and Wales from 335 herds covering 27,970 pregnancies indicated that 14.3 percent of them failed to produce a calf surviving to 6 mo. of age. Abortions occurred in 5.5 percent of the total, and 4.4 percent of the total births were of still-born animals. Of 12,544 females born, 5.5 percent died before the age of 6 mo. Nearly half of these deaths occurred during the first week and three-fourths in the first month. Mortality tended to be higher during the first half of the year, and to increase slightly from south to north. The rate in Scotland was significantly higher than in England and Wales.

The specific gravity of cow's milk, R. C. HUTCHINSON (*Jour. Austral. Inst. Agr. Sci., 6 (1940), No. 4, pp. 205-209*).—A formula and also a table are presented which enable the specific gravity of milk obtained at any temperature within the range of 40°-90° F. to be corrected to 60°.

Examination of lactose content in normal milk, I, II (*K. Vet. og Landbohøjskole [Denmark], Aarskr., 1939, pp. 130-138*).—Analyses of 48 milk samples taken from a large København (Copenhagen) milk supply are reported in part I, *Analytical-chemical Examinations*, by H. C. Jørgensen (pp. 130-133). These showed an average value of 4.969 gm. of lactose hydrate per 100 gm. of milk (range 4.76-5.22) by the Gohr titration method (E. S. R., 63, p. 208) and 4.943 gm. (range 4.72-5.10) by the Scheibe polarization method. Part 2 by P. S. Østergaard (pp. 133-138) presents a statistical treatment of the data.

Antioxygenic fractions of oat and soya bean flour, C. D. DAHLE and D. H. NELSON. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 24 (1941), No. 1, pp. 29-39, figs. 4*).—In an attempt to determine the active antioxygenic fraction in oat flour and soybean flour, the phospholipid fraction and aqueous, alcohol, ether, acetone, and hexane extracts were prepared from these products and tested on dry fresh milk fat by determining the peroxide number of the fat after varying periods of incubation. The phospholipid fraction and the alcohol extract exhibited greater antioxygenic properties than any of the other extracts. In every case the oat flour extracts gave greater protective action on the fat than the corresponding extracts from soybean flour.

The relation of mastitis to the level of ascorbic acid and certain other constituents in milk, E. P. REINEKE, E. R. GARRISON, and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 24 (1941), No. 1, pp. 41-50, figs. 4*).—A comparison of the ascorbic acid content of milk drawn from mastitis-positive and mastitis-negative quarters of cows' udders indicated that udder infections reduced the amount of ascorbic acid in the milk. In early stages of mastitis the reduction amounted to about 10 percent and in later stages from 30 to 50

percent. An inverse relationship between the ascorbic acid and chlorides in milk was noted. Long-chain streptococci isolated from mastitis milk retarded the rate of oxidation of ascorbic acid in vitro, and mastitis milk was not higher in oxidase than normal milk. It is suggested that the effect of mastitis upon the level of ascorbic acid is an indirect action resulting from a change in the selective permeability of the milk-secreting cells in relation to the osmotic equilibrium existing between blood and milk.

Homogenization, P. H. TRACY and A. J. HAHN. (Univ. Ill.). (*Ice Cream Trade Jour.*, 36 (1940), No. 12, pp. 16, 17, 42-45).—Four experiments were conducted comparing the efficiency of a rotary-type homogenizer operated at 500 lb. pressure and high-pressure homogenizers operating at pressures of from 1,000 to 2,500 lb. for processing ice cream mixes. Data are presented on the viscosity of the mix, average fat globule size, time required to reach 100 percent overrun, maximum overrun obtainable, and the melting resistance and body score of the resulting ice cream. In general, the rotary machine did not produce as desirable results as did the high-pressure machine operating above 2,000 lb. pressure, but it did equal 1,000-1,500 lb. pressure on the high-pressure type machine.

Examinations of cream ripening [trans. title], S. KNUDSEN, S. NIELSEN, and H. V. KNUDSEN (*K. Vet. og Landbohøjskole [Denmark], Aarskr.*, 1939, pp. 7-20, figs. 5; *Eng. abs.*, pp. 19-20).—Data are presented on the influence of temperature, amount of inoculum, and age of starter on rate of ripening of cream. When skim milk and the fat-free serum from the cream of the same lot of milk were inoculated with the same starter the cream serum ripened somewhat slower than the skim milk under like conditions. The number of bacteria and the pH followed parallel courses, whereas the titratable acidity continued to rise after the number of bacteria and pH had reached a constant value, due to carbonic acid production by the organisms after reproduction had ceased.

Classification of the organisms important in dairy products.—III, *Pseudomonas putrefaciens*, H. F. LONG, and B. W. HAMMER (*Iowa Sta. Res. Bul.* 285 (1941), pp. 173-195, figs. 2).—This series of investigations (E. S. R., 79, p. 99) has been continued. Of numerous media tested, one composed of gelatin 4 percent, proteose peptone 2, dipotassium phosphate 0.1, ferric ammonium citrate 0.05, agar 1.5, and water to make up 100 percent proved most useful in isolating *P. putrefaciens*. Direct smears on this medium were frequently successful, while in other cases enrichment in litmus milk at 3° C. followed by smears on the medium were more satisfactory. In isolating the organism from butter, the butter serum proved more satisfactory than the butter itself. Many samples of salted putrid butter yielded the organism, but highly ripened unsalted butter consistently failed to show the presence of it. Samples of raw milk and sweet cream, dairy plant equipment and floors, water from streams, lakes, roadside pools, and creamery supplies frequently contained this organism. It has a low thermal resistance and is readily destroyed by acid and salt. Variations between cultures were not sufficiently marked to justify varietal designations. Action on litmus milk, morphology, phosphatase production, and action on butter are outstanding points to consider in the identification of *P. putrefaciens*.

Distribution of *Pseudomonas fragi*, H. B. MORRISON and B. W. HAMMER. (Ky. and Iowa Expt. Stas.). (*Jour. Dairy Sci.*, 24 (1941), No. 1, pp. 9-18).—*P. fragi* was found in 16.5 percent of 176 lots of normal milk from 14 producers in Iowa and in 40 percent of 40 December deliveries of milk to a Kentucky plant, but it was not detected in 17 June deliveries to the same Kentucky plant. Defective dairy products, particularly rancid ones, commonly yielded the

organism, but dairy plant equipment was found to be relatively free from it. In Iowa nearly 10 percent of the dairy-plant water supplies and about one-half of the samples of dirt and other materials or farm equipment likely to be contaminated by dirt harbored it, as compared with 4.1 percent of similar summer samples and 37.4 percent of December samples gathered in Kentucky. Of 35 samples of barnyard soils gathered in several States 90.9 percent from eastern States and 38.5 percent from western States were found to contain it. It is deemed evident that the farm is an important source.

Mold mycelia in cream and butter, P. R. ELLIKER (*Indiana Sta. Cir.* 258 (1940), pp. 12, figs. 6).—The discussion deals with a general description of bacteria, yeasts, and molds, and the significance of these organisms in butter, methods of determining the mold content of cream, factors influencing mold content, and general recommendations for reducing mold growth in cream.

The influence of temperature and various coverings on the curing of five-pound prints of Cheddar cheese, E. L. REICHAERT and P. A. DOWNS. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 1, pp. 19-27, figs. 2).—From five batches of Cheddar cheese 5-lb. loaves taken from each batch were covered with paraffin, wax, and plain, red, black, orange, and yellow parafilm, respectively. Duplicate loaves in each wrapper were cured at 45° and 65° F. The paraffin- or wax-covered cheese aged uniformly better than those covered by the various types of parafilm, all of which were comparatively airtight. Regardless of the type of cover, cheese aged at 45° was of better quality than that aged at 65°. Most parafilm-covered cheese eventually developed a fruity, fermented flavor defect, particularly at the higher temperature, but such defects were not evident in 45°-cheese until after 220 days of curing. Defects in body, particularly Swiss-eye formation, pastiness, and weakness, were much more pronounced in the parafilm-covered cheeses. Weight losses were greatly reduced by the parafilm covering, the black being most efficient in this respect.

The relation of certain factors to the drying of whey mixtures on the atmospheric drum drier, E. L. JACK and A. J. WASSON. (Univ. Calif.). (*Jour. Dairy Sci.*, 24 (1941), No. 1, pp. 85-92, fig. 1).—In order to facilitate the drying of whey on atmospheric drum driers a study was made of the properties of different combinations of whey and film-forming materials which might yield a satisfactory sheet when scraped from the drums. Skim milk solids proved to be a satisfactory material when added as fresh skim milk 1:1, condensed skim milk, or spray-dried skim milk powder (8 lb. per 100 lb. of sweet whey). Drum-process skim milk powder was not satisfactory, and it was not possible to dry a mixture of as high a lactose/nitrogen ratio when casein was used as with other sources of milk solids. Precondensing the whey was of no value in facilitating drying. The amount of fresh skim milk required to produce a satisfactory drying combination increased with the titratable acidity of the whey. Altering the acidity of whey either with sodium hydroxide or mineral acids gave practically the same results as whey which had developed lactic acid to a corresponding acidity. Ground and sifted cereals, such as corn-starch, wheat flour, oats, and barley, proved satisfactory when added at the rate of from 3 to 3.75 lb. per 100 lb. of whey. Similar results were obtained with Cheddar cheese whey and acid-type cottage cheese whey.

Official body and texture criticisms of dairy products judged in the National Contest, G. M. TROUT, W. WHITE, P. A. DOWNS, M. J. MACK, and E. L. FOUTS (*Jour. Dairy Sci.*, 24 (1941), No. 1, pp. 65-70, figs. 3).—A further report of this committee (E. S. R., 83, p. 539), which lists the predominating body and texture criticisms of butter, cheese, and ice cream as used by official contest judges over a period of years.

The corrosive effect of chlorine and lye solutions on metals used in dairy equipment, H. S. HALLER, F. M. GRANT, and C. J. BABCOCK (*U. S. Dept. Agr., Tech. Bul. 756 (1941), pp. 28, figs. 5*).—The corrosive action of solutions of sodium hypochlorite, buffered sodium hypochlorite, and chloramine-T at strengths of 100 and 200 p. p. m. of available chlorine and 0.3-, 0.5-, and 0.7-percent solutions of sodium hydroxide on 15 different metals was determined. The chlorine solutions containing 200 p. p. m. of available chlorine corroded most of the metals in varying degrees, while solutions containing 100 p. p. m. were less damaging on many of the metals. The hypochlorite solutions were particularly destructive to aluminum alloys, while copper was most affected by the chloramine-T. When in contact with the metals, the available chlorine of the solutions was dissipated to a degree dependent upon the corrosive effect of the solution on the metal. On standing, the buffered and unbuffered hypochlorite solutions showed similar stability, both being less stable than chloramine-T of the same strength. The addition of milk rapidly dissipated the chlorine in all solutions. The chlorine in chloramine-T solutions was only moderately dissipated when the solution was used for washing the udders of cows. The lye solutions when used under conditions simulating the treatment of milking machines corroded the various metals to different degrees, aluminum alloys being seriously affected and tin moderately so.

Chlorine sterilization of dairy plant, A. L. PROVAN (*Dairy Indus.*, 5 (1940), No. 9, pp. 240-243).—A review, with 50 references.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the California Station] (*California Sta. [Bien.] Rpt. 1939-40, pp. 30-36, 37-38, 42-43, 43-44*).—The work of the biennium (E. S. R., 81, p. 273) reported relates to acetoneemia in dairy cattle, tuberculosis and mastitis in cattle, calf vaccination for Bang's disease, deer may carry anaplasmosis, development of a new hog cholera vaccine, vesicular exanthema of swine, caseous lymphadenitis in sheep and goats, causes of lambing paralysis (pregnancy disease), eye worms and other parasites of sheep, fleas as carriers of sylvatic plague, roundworms in horses, development of a fowl pox vaccine, lymphomatosis of laying chickens, infectious coryza of chickens, and *Heremita* disease of turkeys.

[Work in animal pathology and parasitology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1939-40, pp. 120-127*).—The work of the biennium (E. S. R., 80, p. 819) reported upon includes miscellaneous animal diseases (equine encephalomyelitis, studies on bovine lymphogenous leukemia, parasitological investigations, and effect of sulfanilamide on botulism in poultry), by J. H. Whitlock, E. E. Leasure, L. M. Roderick, W. W. Thompson, and C. H. Kitselman; Bang's disease, by Kitselman; anaplasmosis and diseases of feeder cattle (mineral deficiencies, ensilage poisoning, shipping fever, pink eye (keratitis), and cornstalk disease), both by H. Farley and Roderick; mastitis, by L. D. Bushnell, V. D. Foltz, A. O. Shaw, and F. W. Atkeson; poultry diseases (protozoan parasites, fowl paralysis, tapeworms, pullorum disease in regard to vaccination with fowl typhoid vaccines, and factors influencing the pullorum agglutination test), by Bushnell and M. J. Twiehaus; and parasitological investigations with tapeworms and factors in the resistance of poultry and man to tapeworms and of poultry to nematodes, both by J. E. Ackert.

[Work in animal pathology and parasitology by the South Carolina Station] (*South Carolina Sta. Rpt. 1940, pp. 71-74, 79-82, 83-86, 96-98, figs. 3*).—The work of the year (E. S. R., 83, p. 540) reported upon includes a study of

the tannins of *Lespedeza sericea*, by E. J. Lease and J. H. Mitchell; phenothiazine as a vermifuge for the internal parasites of sheep, by E. R. Hauser and G. W. Anderson; the effect of sulfanilamide on blood and milk catalase and beta hemolytic streptococci in bovine mastitis, by Anderson and P. G. Miller; the effect of mastitis on the composition of the milk, by Miller, Anderson, and Lease; and a comparison of methods of sanitation in the control of kidney and other round worms of swine, by E. D. Kyzer, R. L. Jones, and Anderson.

[Work in animal pathology and parasitology by the Wyoming Station] (*Wyoming Sta. Rpt. 1940*, pp. 13-14, 16-18, 25-26, 28-29).—Work with pullorum disease in poultry, selenium and other mineral elements affecting plant quality, poisoning from the ground lichen (*Parmelia molliuscula*), abortion in ewes, and fowl paralysis and a study of the relation between the parasites of game animals and domestic animals are briefly considered in this report (E. S. R., 83, p. 541).

Variation in immune response to *Brucella abortus* depending on route of administration, P. O. HAGEMAN and J. A. DOUBLY (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 801-802).—Rabbits develop agglutinins for *B. abortus* following intravenous injections but fail to do so after sizeable doses are introduced into the stomach.

The cultural and biochemic properties of *Erysipelothrix rhusiopathiae*, A. G. KARLSON and I. A. MERCHANT. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 5-10).—Presented with a list of 49 references to the literature.

The relative efficiencies of disinfectants in killing *Erysipelothrix rhusiopathiae*, E. C. McCULLOCH and S. A. FULLER. (Wash. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 77-83, figs. 2).—It is shown that *E. rhusiopathiae* is readily destroyed by household lye (sodium hydroxide) and the hypochlorites. Household lye is considered the most practical disinfectant where it can be used. Phenol, liquor cresolis and related products, Lugol's solution, tincture of iodine, triethanolammoniumlauryl sulfate, and household soaps also are moderately effective. *E. rhusiopathiae* is resistant to formaldehyde, hydrogen peroxide, alcohol, and salt brines.

Laboratory tests of the potency of antirabic vaccines, R. W. G. WYCKOFF (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 84-90).

The penetration of radioactive phosphorus into encysted *Trichinella* larvae, O. R. MCCOY, V. F. DOWNING, and S. N. VAN VOORHIS (*Jour. Parasitol.*, 27 (1941), No. 1, pp. 53-58, figs. 2).—Report is made of three experiments in which 28 rats heavily infected from 8 to 10 mo. previously with *T. spiralis* were fed radioactive phosphorus (as basic sodium phosphate) and killed and examined at intervals beginning 2 hr. later. Radioactive phosphorus was detected in the larvae as early as 2 hr. after feeding, and the amount increased rapidly during the first 24 hr. The maximal content was reached on the fourth day, after which there was a gradual decline. The absorption and loss of radioactive phosphorus by the larvae followed a course different from that for the hosts' muscles. The experiments demonstrate that a ready exchange of phosphate ions may take place through the cyst wall surrounding *Trichinella* larvae in the muscles of rats, and imply that the larvae may be undergoing active metabolism during the encysted stage.

A comparison of flotation solutions in the detection of parasite ova in feces, F. R. KOUTZ. (Ohio State Univ.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 95-100).

Uses of a lauryl sulfate tryptose broth for the detection of coliform organisms, W. L. MALLMANN and C. W. DABBY. (Mich. Expt. Sta.). (*Amer.*

Jour. Pub. Health, 31 (1941), No. 2, pp. 127-134).—Report is made of a study aimed to develop improved methods of procedure for the isolation of the coliform group from water, both qualitatively and quantitatively. It is shown that the confirmatory media used at the present time in standard methods act as suppressing agents to the coliform organisms and produce a lower colon index than would be obtained if more suitable confirmatory media were used. The data also indicate that in lauryl sulfate tryptose broth gas production could serve not only as a presumptive test but also as a confirmatory medium for routine testing. It was observed that when gas is produced in lauryl sulfate tryptose broth confirmation is always obtained. The details of the work appear in 13 tables.

The principles of parasite control, T. W. M. CAMERON (*Quebec Natl. Business Pubs., Ltd.*, 1940, pp. 48, [figs. 2]).

Comparative immunologic response in rabbits following the injection of heat-killed *Pasteurella avicida* by several routes and of sonic disintegrated *P. avicida* intracutaneously, P. H. LANGNER, JR., J. S. FORRESTER, and F. W. LANGNER (*Jour. Immunol.*, 40 (1941), No. 2, pp. 153-159).—The intravenous injection of heat-killed *P. avicida* gives a better agglutinin response and protective resistance than either the subcutaneous or intracutaneous route.

The anthelmintic efficiency of phenothiazine against immature *Haemonchus contortus*, H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 245-246).—The experiments reported have shown that phenothiazine in doses of 0.6 gm. per kilogram of body weight is highly efficient in destroying immature *H. contortus* 10 and 15 days old.

The use of sulfonamide drugs in certain bacterial infections, J. O. WEILBAECHER, JR., H. J. DUPUY, and H. M. TAYLOR. (La. State Univ. et al.). (*New Orleans Med. and Surg. Jour.*, 93 (1941), No. 9, pp. 455-459).—The therapeutic effect of sulfonamide drugs in streptococcal, pneumococcal, staphylococcal, and miscellaneous infections is briefly reviewed, accompanied by a list of 37 references to the literature.

Methods of evaluating the efficacy of anthelmintics, H. E. MOSKEY and P. D. HARWOOD. (U. S. D. A. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 55-59).

The toxicity of levulose cyanhydrin, together with general observations on cyanide poisoning, A. N. WORDEN (*Vet. Rec.*, 52 (1940), No. 50, pp. 857-865).—The toxicity of levulose cyanhydrin, sometimes formed in the fumigation of certain foodstuffs by hydrocyanic acid gas, is shown to be of a high order, apparently proportional to its actual HCN equivalent. "Conditions within the alimentary tract of both dog and rabbit apparently favor dissociation into levulose and toxic HCN and not hydrolysis to nontoxic hydroxy acid and ammonia. Levulose cyanhydrin was administered in high daily but singly sublethal doses to the dog, rabbit, and human subject without ill effect. It is emphasized that, following ingestion of the cyanide radicle in any form, symptoms are determined by rate of elimination and detoxication of HCN in relation to rate of absorption into the blood stream, and that it is the actual amount of potential HCN absorbed at any one feeding time which determines the toxicity. An interval of 2½ hr. is sufficient to enable a rabbit to dispose of ½ m. l. d., and repeated dosage at this rate has no cumulative effect." These findings are considered in relation to alleged cases of HCN poisoning of plant origin, and particularly to those ascribed to the feeding of linseed cake.

Vitamin K and sweet clover disease, B. W. FAIRBANKS and E. CURZON. (Univ. Ill.). (*North Amer. Vet.*, 21 (1940), No. 11, pp. 657-659).—Vitamin K or one of its derivatives appears to be a requisite in the formation of pro-

thrombin, a necessary element in blood coagulation. This vitamin can be formed in the intestinal tracts of most animals by bacterial action, and hence may not need to be supplied in the diet except in some cases, as with very young animals, where bacterial action in the intestinal tract is slight. Vitamin K appears to be of no benefit in treating sweetclover disease, which is caused by a compound formed from coumarin, the bitter principle of this plant, during spoilage of the hay.

The surgical anatomy of the teat of the cow, H. L. FOUST. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 143-149, figs. 8).

An alkaline culture medium for differentiation of staphylococci and micrococci from cow's milk, W. I. B. BEVERIDGE (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 4, pp. 391-392).—It is shown that "alkaline blood agar at a final pH between 8.8 and 9.0 can be used as a selective medium for staphylococci in cows' milk. Small numbers of staphylococci may be isolated from milk containing large numbers of micrococci by the use of this medium. Growth on alkaline blood agar showed a close positive correlation with hemolysis in a series of strains of staphylococci and of micrococci isolated from milk. The same clear-cut results were not obtained with human strains, but the results suggest that growth on alkaline medium may be a useful indication of pathogenicity in strains of human origin."

Anaplasmosis recognized in Ohio, L. W. GOSS, J. W. MILLS, and W. F. GUARD. (Ohio State Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, p. 151).—Report is made of one of several cases of anaplasmosis that occurred in a herd of Hereford cattle shipped from Texas to Ohio in the spring of 1939.

Standardization of stained *Brucella abortus* antigen for the whole-blood test, H. MARSH. (Mont. Expt. Sta. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 46-49).—The author has found it possible to eliminate significant variations in sensitivity of the stained antigen for the whole-blood agglutination test for Bang's disease (1) by using five strains of *B. abortus* of known antigenicity, (2) by washing the culture growth from the medium with large amounts of phenolized saline solution and washing the cells once in phenolized saline before making the final suspension, as recommended by Roepke and Fitch (*E. S. R.*, 84, p. 390), and (3) by staining the antigen by the addition of 5 percent of a freshly prepared and filtered 1.5 percent (saturated) aqueous solution of crystal violet (Coleman and Bell) as the last step in the preparation of the antigen. This concentration of dye has the same effect on sensitivity as 0.4 percent gelatin.

Studies on bovine mastitis: Mastitis in heifers, C. C. PALMER, J. C. KAKAVAS, and J. R. HAY. (Univ. Del.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 18-34).—Report is made of a study of mastitis infection in 3 large herds of pure-bred dairy cattle, in 1 of which the disease assumed epizootic proportions, while in the other 2 only a few sporadic cases occurred. "*Staphylococcus aureus* was the predominating causative agent. Streptococci were isolated from the udder exudate of infected quarters in 10 heifers. In 4 heifers streptococci were the only organisms isolated; in 5 heifers streptococci were isolated in pure culture from certain infected quarters, whereas other infected quarters gave pure cultures of *S. aureus*; and in 1 heifer the streptococci were mixed with *S. aureus*. Of the 10 heifers infected with streptococci, only 1 gave typical mastitis streptococci (Lancefield group B), 2 heifers gave Lancefield group C streptococci, and 7 heifers gave an unusual streptococcus. The unusual streptococcus appears to be an organism not previously described in connection with mastitis. Of the 7 heifers giving the new streptococcus, this was the only organism isolated in 3 heifers; in 3 others it was isolated in pure culture from certain quarters and

S. aureus in other quarters; and in 1 heifer it was mixed with *S. aureus*. The new streptococcus was capable of reproducing mastitis in an experimental heifer.

"Culturing the milk or exudate upon ox blood-tryptose agar plates was found to be the most satisfactory method for the isolation of pathogenic streptococci and staphylococci. Abnormal swelling of the udder of heifers may be physiologic or pathologic. If physiologic, the exudate is usually more viscid, may clot upon standing, and upon bacteriologic examination will be sterile. A few of the infected heifers gave no indications of being infected until calving time, when they freshened with one or more 'blind' quarters. Udder infections in heifers with pathogenic staphylococci or streptococci, unless destroyed by natural recovery or by treatment, produce serious pathologic changes in the udder. Fibrosis was the most common pathologic change in this group of animals. Necrosis of the infected quarters occurred in 2 heifers, and abscess formation occurred in 1 heifer. When the fibrosis is well established the lactiferous sinus and sometimes the teat duct become obliterated by proliferated connective tissue producing what dairymen term blind quarters. Natural recovery was observed in mature cows infected with staphylococcal mastitis. Generalized infection following mastitis, in which *S. aureus* was isolated in pure culture from the blood stream, was observed in 1 heifer. In natural recovery in mature cows with staphylococcal mastitis, bacteriophage specific for the invading organism was demonstrated in the milk. Treatment consisting of frequent stripping of the infected quarters and the application of warm fomentations was unsuccessful in promoting recovery in heifers with nonmilking udders. Bacteriophage therapy gave satisfactory results in infected heifers with nonfunctioning udders but was of doubtful value in infected heifers with functioning udders."

The occurrence in New South Wales of bovine mastitis associated with *Streptococcus dysgalactiae*, D. F. STEWART (*Austral. Vet. Jour.*, 17 (1941), No. 1, pp. 18-19).—The cases of mastitis reported are said to be the first to be found associated with *S. dysgalactiae* in New South Wales.

Microscopic detection of mastitis, S. HADWEN (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 11-17, figs. 30).

The elimination of mastitis (preliminary report), G. J. HUCKER. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 3, pp. 159-161).

The use of trypanflavin in the infusion therapy for streptococcal mastitis, O. W. SCHALM. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 117-126).—In further control work with mastitis (*E. S. R.*, 83, p. 679), "a 1:4,000 aqueous solution of trypanflavin, as used in these experiments, was found to be too irritating to be employed with safety in the infusion therapy for streptococcal mastitis, even when left in the udder for only 5 min. A 1:10,000 aqueous solution of trypanflavin is as efficient as a 1:4,000 concentration in eradicating the mastitis streptococci from udder tissues and is much less irritating. With lactating cows, from 800 to 1,200 cc. may be infused per quarter and left in for from 5 to 15 min. with safety. In dry udders it may be left in overnight. The udder tissues have a marked capacity for retaining infused aqueous solutions. The efficiency of eliminating the streptococci and the degree of irritation are influenced by the amount of trypanflavin retained by the udder. Since the amount retained by individual quarters varies considerably, the results obtainable with aqueous solutions of trypanflavin are unpredictable. By using a hypertonic (20 percent) sugar solution as a vehicle for the trypanflavin, it is possible to milk out, after a lapse of from 5 to 10 min., a volume of fluid equal to that infused in as high as 98 percent of the cases. The sugar holds the fluid in the duct and cistern spaces and thus

prevents its absorption by the tissues. By employing a hypertonic sugar solution as a vehicle, it is possible to use a much greater concentration of tryptafavin without damaging the udder tissues, and in this manner the efficiency of the treatment is increased. The mastitis streptococci for the most part localize in the gland cistern and associated large ducts. By treating the cistern region intensively with a 1:1,500 concentration of tryptafavin in 20 percent sucrose solution, as high as 69 percent of quarters infected with *Streptococcus agalactiae* were cured by one infusion and as high as 93 percent by two infusions. Since the capacity of the cistern region of a quarter varies with udder size, it may be necessary to vary the volume of fluid infused from the 400 cc. recommended by Steck [E. S. R., 73, p. 103] in order to obtain maximum efficiency in elimination of the streptococci."

An outbreak of bovine pseudorabies, or "mad itch," C. C. MORRILL and R. GRAHAM. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 35-40, figs. 7).—Field and laboratory observations made during a spontaneous outbreak of pseudorabies in cattle in Illinois are reported. The characteristics of the disease and its causative agent are described as they were observed. As a control measure, the prompt removal of all swine, even though apparently healthy, from contact with the cattle is recommended.

Grass tetany in cattle, A. F. NOLAN and F. E. HULL. (Ky. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 41-45).—Following a brief review of the literature, reports of 12 cases of grass tetany observed by the authors are presented. A discussion of blood analyses is included.

Experimental work upon recent outbreaks of abortion in ewes, A. M. LEE and L. H. SCRIVNER. (Wyo. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 50-54).—Report is made of an investigation of abortion in ewes, outbreaks of which have occurred in Wyoming in recent years. A report of the earlier work conducted has been noted (E. S. R., 78, p. 700). A *Vibrio* was definitely established as the cause of the disease in three of the five outbreaks in the State that were investigated. The results obtained are thought to prove that the disease is transmitted from aborting ewes to noninfected ewes in from 10 to 21 days or longer. The importance of preventing the spread of the infection that takes place through contact with infected ewes in the flock is indicated.

Gastrointestinal parasites of sheep and their control, R. E. REBRASSIER. (Ohio State Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 124-128).—It is concluded that the control of gastrointestinal parasites of sheep cannot be accomplished alone, under practical conditions, by either rotation of pastures, nutrition, anthelmintic medication, or any other one factor. The best plan is to employ all of the above factors to the extent permitted by conditions present on the farm.

Studies on fly strike in Merino sheep.—IV, The effect of fly strike on reproduction. V, Review of results obtained by the Mules operation for the prevention of crutch strike in the trial at "Dungalear," N. S. W., D. A. GILL and N. P. H. GRAHAM (*Jour. Council Sci. and Indus. Res. [Austral.]*, 18 (1940), No. 4, pp. 261-266, fig. 1; pp. 266-272, fig. 1).—A continuation of this series (E. S. R., 82, p. 822).

Phenothiazine for stomach worms of sheep and goats, I. B. BOUGHTON. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser*, 11 (1940), No. 3, pp. 32-35).—Experimental and range tests have shown phenothiazine to be highly efficient in killing the common stomach worm when given to infested sheep and goats. No toxic effect has been observed even when given in large doses. When administered at the rate of 0.3 gm. per pound of body weight the

stomach worms were gone within 48 hr., while animals receiving 0.2 gm. per pound of body weight still harbored a few when autopsied. The single dose did not kill all of the hairworms (*Trichostrongylus*) and in several lambs a few nodular worms (*Oesophagostomum*) were found alive. The drug apparently had no effect on either the broad white or the fringed tapeworms or on the whipworms found in the blind gut. The tests indicate that animals heavily infested with hairworms need more than one dose of the medicine before all the parasites are killed. In several tests in which heavily infested range lambs were rounded up, drenched immediately, and then returned to the pastures, the eggs dropped with the feces approached or reached the vanishing point within 1 week of treatment. They continued to be absent from the feces or present in but small numbers for some 55 days. The staining of the wool by the urine for several days after treatment is mentioned as a disadvantage.

The passage of phenothiazine through the alimentary canal of the sheep, M. LIPSON and H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 240-244, fig. 1).—Experiments are reported which show that "when sheep are dosed with phenothiazine it is usually detectable in the feces 12 hr. later. Preliminary administration of copper sulfate solution brings about an earlier appearance of phenothiazine in the feces. The fecal concentration tends to reach its maximum value at the end of the first day or at the beginning of the second day after dosing. Elimination is usually complete at the end of the fourth day, but if the sheep are constipated this period is prolonged. In 12 experimental animals, the average amount of phenothiazine passed in the feces was only 32 percent of the dose received. There was no correlation between anthelmintic efficiency and the concentration of phenothiazine reached in the feces. Ruminal and abomasal injections of phenothiazine in the same animal did not produce any substantial difference in the total amounts excreted in the feces, namely 24 percent and 30 percent, respectively. There is, however, a greater excretion in the 22 hr. following injection when the dose is given in the abomasum than when it is given in the rumen."

Caseous lymphadenitis of deer (*Odocoileus hemionus*) in Washington, L. SEGGETTI and F. D. MCKENNEY. (Wash. State Col. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 129-131).—Reports of the finding of diseased deer in the Northwest, received from hunters, game protectors, and other game officials, led to laboratory studies of two entire carcasses and two parts of carcasses and the isolation of *Corynebacterium ovis* from characteristic abscesses in four deer. The etiology of this organism is identical with that of the organism that causes caseous lymphadenitis in sheep. A cultural study of this organism, with observations of the symptoms and lesions produced in experimental animals, is important to differentiate the disease from other suppurative processes.

Endocarditis in swine due to *Erysipelothrix rhusiopathiae* and to streptococci, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 132-133).—Report is made of findings during the past 10 yr., in which time 19 cases of endocarditis, all manifesting distinctive proliferative vegetations, were examined and studied in the laboratory. The study included a gross and microscopic examination of the lesions in the heart and the bacteria responsible for them. They represented about 1 percent of the porcine hearts examined for the same period. "From the standpoint of the bacteria isolated, *E. rhusiopathiae* was obtained from 11 and streptococci from 8. Beyond determining the hemolytic characteristic of the streptococci isolated, no further attempt was made to classify them. Five of the cultures produced the beta type hemolysis when grown on blood (horse) agar plates,

and two were nonhemolytic. One culture was not studied for this characteristic. The gross appearance of the vegetations was strikingly similar in all 19 cases. They were characterized by funguslike growths attached to one or more of the valves of the heart and in some cases to the mural endocardium."

The importance of determining the specific cause of the vegetations occasionally found in the hearts of swine is obvious, the treatment and management of the animals in the drove depending upon a definite diagnosis. The approved methods of handling swine erysipelas should be instituted when this disease is present. No specific therapy is indicated where the disease is due to a streptococcus.

Swine erysipelas, the agglutination test for its diagnosis, and a report on a study of arthritis in swine, C. G. GREY, O. L. OSTEN, and H. W. SCHOENING. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 74-76).—A description is given of the preparation of the antigen for the plate agglutination test for swine erysipelas, together with an interpretation of the test and its limitations. Of 472 arthritic joints from swine which were examined bacteriologically, 357 yielded *Erysipelothrix rhusiopathiae*. The material originated in 91 counties in 14 States.

Ophthalmology in Equidae, B. J. ERRINGTON. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 115-123).—The results of a 3-yr. study of periodic ophthalmia in horses and mules, conducted with a view to determining the cause, method of prevention, and treatment of the disease, are presented. In an investigation of the normal variations, the inflammatory changes, and the pathological lesions to which the eyes of horses are subject, and to differentiate between those which are symptomatic of periodic ophthalmia and those which are unrelated to the disease, a detailed examination was made of the eyes of 2,415 horses and mules. They represented animals of all ages as they are found on the breeding farms in the Lexington, Ky., area. In addition to these and farm horses and mules, a group of 50 city horses, one of 126 Army horses, and one of 67 range-bred horses were examined. Of 2,121 animals in groups where all were examined, 8.3 percent had periodic ophthalmia. The observations made in these clinical examinations indicate that there is a considerable amount of variation and pathology in the eyes of horses.

"The symptoms of periodic ophthalmia are due to an inflammation of the iris and ciliary body. While the acute external symptoms—conjunctivitis, increased lacrimation, photophobia, keratitis, and exudate in the aqueous—are frequently present, diagnosis of iridocyclitis is positive with the presence of (1) contracted pupil, with decreased iris reflex and resistance of the iris to mydriatics; (2) vitreous opacities; and (3) decreased intraocular pressure. All the latter symptoms are usually present. . . . Observations indicate that there are at least four types of iridocyclitis, with symptoms and lesions similar to so-called periodic ophthalmia, which may be of different causes. These are: (1) Primary iridocyclitis. It is characterized by acute, recurring attacks and is seen more commonly in young and middle-aged horses. If periodic ophthalmia proves to be a specific disease it will probably be this type of case. (2) Chronic iridocyclitis. The external symptoms of acute attacks may be unobserved or occur late in the course of the disease. The course and lesions in these cases indicate that they are a chronic form of the disease known as periodic ophthalmia. (3) Symptomatic iridocyclitis. This occurs as a complication of some other primary disease. (4) Traumatic iridocyclitis. In the last two types, acute symptoms typical of periodic ophthalmia occur. Lesions may remain, following the acute attacks in these cases, but recurrences of the acute symptoms are less frequent than in primary iridocyclitis. There is, however, always a tendency for a re-

currence in any iridocyclitis, depending upon the severity of the attack and the remaining lesions as well as the cause. Symptomatic iridocyclitis should be suspected with accompanying general symptoms. The history, evidence of injury, or course of the attack are usually sufficient to indicate trauma. The one occasion in which a high incidence of choroiditis was present in a group of horses, which also had a high incidence of periodic ophthalmia, may indicate another cause of iridocyclitis or simply add to the symptom complex of the disease called periodic ophthalmia."

Vitamin A deficiency in horses, C. E. HOWELL, G. H. HART, and N. R. ITTNER. (Univ. Calif. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 60-74, figs. 6).—A brief review of earlier studies of vitamin A deficiency rations as observed in the horse is presented with a list of 16 references to the literature. Case reports are made of 10 horses and a replacement animal that were divided into groups and placed on deficiency rations. That the progressive condition in these animals leading to death from vitamin A deficiency reveals a quite characteristic syndrome in this species is indicated. Night blindness, lacrymation, keratinization of the cornea, respiratory symptoms, reproductive difficulties, capricious appetite, progressive weakness, and death occur quite regularly. Accompanying these symptoms in all cases there developed joint involvement with lameness and characteristic rarefying lesions in the joint cartilages. Positive evidence that the joint condition was due primarily to the vitamin A deficiency was not obtained, but the evidence pointed to the possibility of this being the case. Varying the calcium : phosphorus ratio from 2 : 1 to 1 : 7 in the diets did not seem to play an important role in the nutrition of the animals. The advanced bone alterations in 1 horse, if due to this cause, were evidence of marked individual variation. Rations commonly fed to horses where yellow corn is not available are liable to be deficient in vitamin A.

Phenothiazine as an anthelmintic for horses and mules, B. J. EBBERTON and C. WESTERFIELD. (Ky. Expt. Sta.). (*Vet. Med.*, 35 (1940), No. 12, pp. 688-693, fig. 1).—Following a brief review of the earlier work with phenothiazine as an anthelmintic, by Harwood and his associates, for swine (*E. S. R.*, 81, p. 105), sheep (*E. S. R.*, 81, p. 715), and horses (*E. S. R.*, 83, p. 399), and by Howell and Britton (*E. S. R.*, 84, p. 531) as an equine anthelmintic, report is made of the results of its administration to 55 horses and mules. The findings in fecal examinations of 37 of the 55 animals for strongyle eggs before and after treatment with phenothiazine at the rate of from 10 gm. for sucklings up to 60+ gm. (90 gm. in one case) for horses and mules from 1 to 25 yr. old are presented in detail in table form. The results of hematological examinations of 4 horses recovering from the effects of phenothiazine, the variation of erythrocyte counts in normal horses not receiving phenothiazine, and the effect of single 1-oz. doses of phenothiazine on 6 horses are also summarized in tables.

It is concluded that phenothiazine is highly efficient in the elimination of mature strongyles from horses and mules, as determined by fecal egg counts. The drug has no effect upon bots, little if any effect upon strongyloides of suckling foals, and apparently is not altogether effective for ascarids of the horse. One to 1½ oz. for yearling thoroughbreds and 2 oz. for mature thoroughbreds and average-sized farm horses is a sufficient dose. It appears that commercial phenothiazine produces a decrease in total red cells and hemoglobin which seems to be in proportion to the amount of drug received. The erythrocyte count returned to its previous level in about 4 weeks.

Some helminths of dogs and cats transmissible to man in the Philippines, with reference to their methods of transmission and prevention, P. G. RUFUENZO (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 6, pp. 493-524).—A

brief account is given of the role of dogs and cats in the transmission of parasites to man in the Philippines, together with a bibliography of five pages. Some of the helminths transmitted are considered, with notes on their distribution, manner of transmission, and methods of prevention.

The principle of tissue autolysis and its possible application in canine therapy, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 767, pp. 134-137).—The toxic products of degenerated or destroyed tissue cells was shown to be an important factor in disease and surgical procedures. Considerable immunity against these toxic products arises through the immunization of dogs and chickens to normal homologous (species) liver tissue. It is suggested that the efficacy of blood transfusions in dogs possibly can be increased by first immunizing the donor against canine tissues. The preparation of tissue and method of procedure for the immunization of donors is described.

Bibliography of poultry diseases (*Bibliog. Poultry Diseases, Lab. Workers Pullorum Disease Control* [New Brunswick, N. J.], 1 (1936), Nos. 1, pp. [1]+18; 2, pp. [2]+12; 2 (1937), Nos. 1, pp. [2]+16; 2, pp. [2]+23; 3 (1938), Nos. 1, pp. [2]+16; 2, pp. [2]+23; 4 (1939), Nos. 1, pp. [2]+24; 2, pp. [2]+33; 5 (1940), Nos. 1, pp. [2]+21; 2, pp. [2]+20).—This bibliography of poultry diseases compiled by laboratory workers in pullorum disease control through a committee on bibliography consisting of E. Jungherr, H. Van Roekel, and F. R. Beaudette, is classified under the headings of virus, bacterial, mycotic, protozoan, parasitic, and nutritional diseases, toxicology, etc.

Avitaminosis A in commercial poultry flocks, M. RUBIN, H. R. BIRD, and H. M. DEVOLT. (Univ. Md.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 155-160, fig. 1).—Report is made of the results of assays for vitamin A of 80 liver samples from chicks suspected of borderline vitamin A deficiency, in which use was made of the Carr-Price technic.* There were 13 samples, representing 10 of the 25 commercial flocks from which the chicks came, that contained no vitamin A and a total of 30 samples from 13 flocks which contained less than 15 blue units of vitamin A per gram of liver. It is concluded that borderline vitamin A deficiency was at least partly responsible for the slow growth and development of these chicks, and that it may be a more important difficulty in commercial poultry flocks than has been realized. Evidence is presented to indicate the extent to which poor quality alfalfa leaf meals may be responsible for this situation.

The effect of selenized grains on the rate of growth in chicks, W. E. POLEY, W. O. WILSON, A. L. MOXON, and J. B. TAYLOR. (S. Dak. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 171-179, fig. 1).—The experiments reported were conducted with a view to determining (1) how much selenium could be utilized by chicks without reducing growth and causing mortality and (2) whether or not chicks hatched from hens receiving submaximal tolerance levels of selenium were more susceptible to selenium poisoning during the starting period than chicks hatched from hens receiving no selenium.

The chicks were hatched from hens given submaximal tolerance levels of 2 and 4 p. p. m. of selenium in breeder rations. "The growth rate of chicks receiving the control starting ration containing no selenium was slower when the chicks were hatched from dams receiving 4 p. p. m. of selenium than when the chicks were hatched from dams receiving no selenium or 2 p. p. m. of selenium in their breeder rations. On the other hand, when the chick starting ration included either 5 or 8 p. p. m. of selenium, their growth rate was not reduced when the chicks' dams received 4 p. p. m. of selenium in their breeder rations. In five out

* *Biochem. Jour.*, 20 (1926), No. 3, pp. 497-501.

of six trials both the males and females receiving 2 p. p. m. of selenium grew at a somewhat faster rate than those receiving no selenium. There was evidence that 10 p. p. m. of selenium adversely affected the growth rate of chicks, while 14 p. p. m. in the starting ration was considerably more toxic and not only caused excessive mortality but also reduced growth severely. Levels of 5 to 8 p. p. m. of selenium in growing rations resulted in equally good growth among pullets from 8 to 24 weeks of age when compared with the growth of pullets receiving no selenium. Since 8 p. p. m. proved to be the maximum level at which naturally occurring selenium could be satisfactorily used in starting rations, on the basis of the results of these experiments it is recommended that starting and growing rations contain not more than 5 p. p. m. of selenium. This will allow for a margin of safety."

A successful method of immunization against Newcastle disease of fowls, S. G. IYER and N. DOBSON (*Vet. Rec.*, 52 (1940), No. 52, pp. 889-894, figs. 7).—Experimental work with fowl-passaged virus in an attempt to produce a satisfactory immunizing agent against Newcastle disease gave negative results. Through serial inoculations of the chorioallantoic membrane of the developing chick embryo with Newcastle disease virus, a method was developed for the production of a safe and reliable vaccine with excellent immunizing qualities. From 14 to 33 serial passages through the developing egg were found to be necessary before the fully virulent English strain of the virus was sufficiently attenuated to be safe for use as an immunizing agent.

Controlling gapeworms in poultry, E. E. WEHR (*U. S. Dept. Agr. Leaflet 207* (1941), pp. [1]+6, figs. 4).—A practical account is given of gapeworm parasitism in poultry, the parasite, symptoms, source and manner of infection, wild birds as hosts, prevention, and treatment.

In tests by the author, barium antimonyl tartrate inhaled by the fowl in the form of a dust has proved to be the most effective in removing gapeworms. In applying this treatment the infected birds are placed in a closed container and exposed to the powder for from 15 to 20 min.

Use of tin preparations for the treatment of chickens experimentally infected with tapeworms, J. E. GUTHRIE and P. D. HARWOOD. (*U. S. D. A.*). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 108-116).—Tests are reported which show that inorganic and organic tin compounds are of some value for the removal of tapeworms from experimentally infected chickens. "Mixtures containing a small amount of synthetic pelletierine hydrochloride and one of the following tin compounds, namely, tin oleate, stannous oxalate, stannous oxide hydrate, or stannous tartrate, effectively removed *Railletina costicillus* from chickens infected with 50 cysticeroids each. Mixtures of 0.3 to 1 gm. of stannous tartrate and 0.07 to 0.2 gm. of synthetic pelletierine hydrochloride were administered to 58 birds with an average indicated efficacy of 80.8 percent. A mixture of synthetic pelletierine hydrochloride and stannous tartrate was better than 95 percent effective for the removal of *Hymenolepis carioca* from 9 chickens which had been experimentally infected with 1,000 cysticeroids each. Available information suggests that the therapeutic index is high enough to offer a sufficiently wide margin of safety for these mixtures." A list is given of 34 references to the literature.

Successful chemotherapy of a virus disease of the canary, F. COULSTON and R. D. MANWELL (*Amer. Jour. Vet. Res.*, 2 (1941), No. 2, pp. 101-107, figs. 15).—Account is given of the pathology and transmission of canary pox, a virus disease which occurs in three symptomatically different forms and combinations of forms and often in a highly virulent form, killing virtually all the birds that it attacks. The disease was successfully treated with mercurio-

chrome in an alcohol-acetone solution applied both locally and, in very small doses, orally. This method of treatment is successful in nearly all cases unless they are quite advanced. Recovered birds exhibit a strong immunity to re-infection, particularly if they have been infected to begin with by a virulent virus.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the California Station]. (Partly coop. U. S. D. A. and Colo. State Col.). (*California Sta. [Bien.] Rpt. 1939-40, pp. 16-17, 129-137*).—This report notes work on forest influence on mountain watersheds, sugar-beet machinery, a rubber-roller bean thresher, rubber-roller flax harvesters, orchard-heating experiments, air-conditioned greenhouses, new soil fumigant applicator, spraying and dusting equipment, water requirement of crops, new irrigation equipment, evaporation of water from soils, and portable-sprinkler systems.

[Agricultural engineering investigations at the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1939-40, p. 6*).—This report briefly discusses work on tests of a new four-wheel tractor, losses in potato storage from different handling methods, and farm efficiency with reference to farm equipment (coop. U. S. D. A.).

[Agricultural engineering investigations at the Wyoming Station]. (Partly coop. U. S. D. A.). (*Wyoming Sta. Bul. 243 (1941), pp. 7-8, 22, 23, 41, fig. 1*).—This report notes the furrow drill as a means to a greatly increased certainty of winter wheat production; the use of pitting machines, including especially an eccentric one-way plow, to prepare summer fallow in such a way as to double the yields which follow the use of the common moldboard plow; and the manufacture by implement makers of large quantities of the disks required for this special plow. The waste of irrigation water under various applications and prolonged ponding of irrigation water as a method of alkali control are also discussed.

Maximum discharges at stream-measurement stations through December 31, 1937, G. R. WILLIAMS and L. C. CRAWFORD; with a supplement including additions and changes through September 30, 1938, W. S. EISENLOHR, JR. (Coop. U. S. D. A. et al.). (*U. S. Geol. Survey, Water-Supply Paper 847 (1940), pp. III+272, fig. 1*).—This report is a compilation of the highest known discharges at most gaging stations in the United States and at several places on boundary streams in Canada and Mexico. Records of flood discharges for several thousand drainage areas are summarized covering scores of years and a few going back more than 100 yr.

Alkali salts in the Big Horn River. (Coop. U. S. D. A. et al.). (*Wyoming Sta. Rpt. 1940, p. 8*).—This report briefly notes completion of 2 years' study of the relation of salt burden to total discharge as affecting the saline content of the irrigated lands.

Non-pressure preservative treatment of southern pine posts (*South Carolina Sta. Rpt. 1940, pp. 20-21, fig. 1*).—This is a discussion of work by G. H. Dunkelberg, G. B. Nutt, H. T. Polk, and A. R. Reed.

Machinery for growing corn, C. K. SHEDD, J. B. DAVIDSON, and E. V. COLLINS. (Coop. Iowa Expt. Sta.). (*U. S. Dept. Agr. Cir. 592 (1940), pp. 30, figs. 15*).—To test the performance of the various machines available for use in corn production a cooperative study of corn-production machinery has been carried on since 1931. The field experiments were located on the Iowa State College Agricultural Engineering Research Farm, a soil map of which is shown. The topography of this farm is relatively flat and the natural surface drainage

inadequate. A system of tile drainage has been installed but during heavy rains some ponds form in the fields.

With respect to seedbed preparation it was shown that cornstalks were covered satisfactorily in plowing under some conditions without any preparation previous to plowing. Plowing was the only method of primary preparation of seedbed generally satisfactory, although cheaper methods of preparation were successful under some conditions. Better work was done by 16-in. than by 14-in. plows. Plow jointers improved coverage of crop residues and trash. Labor and power expenditures in plowing were about in proportion to depth of plowing. From plowing up to the time of planting, in the absence of quack-grass or other perennial weeds, the single-disk harrow produced as good results as did a field cultivator. A tandem-disk harrow was more effective than the single-disk harrow in filling up tractor wheel tracks and leveling off other irregularities. One tillage of plowed ground with tandem-disk harrow and spike-tooth harrow just before planting was generally sufficient seedbed preparation. Additional tillage did not improve weed control, stand, or yield of corn. A single tillage with a single-disk harrow or with a field cultivator proved insufficient preparation in one experiment. For lighter operations and final preparation of seedbed, the spike-tooth harrow was preferable to other machines, except that a rotary hoe section was better adapted for use attached to the plow for spring plowing.

Concerning planting it was observed that the rate of work with four-row tractor planter was 4.5 acres per hour when checkrowing or 7.5 acres per hour when drilling. Surface planting was generally found preferable to furrow planting, although there was no difference in yield. Row spacings of 42, 30, and 21 in. were all found mechanically feasible.

Early cultivation with spike-tooth harrow, spring-tooth weeder, or rotary hoe was effective in killing small weed seedlings when the soil had been lightly crusted by moderate rainfall. Labor and power requirements in using these machines were low. Early cultivation with a sweep cultivator after the corn had grown large enough for thorough weed coverage in the corn row destroyed practically all weeds. During 6 yr., early cultivation was omitted without causing yield reduction except in 1 yr. when wet weather prevented later cultivation at the proper time. Cultivator performance was improved by use of sweeps rather than shovels. Disk hillers were the most effective equipment for covering weeds in the corn row. An experimental spring-tooth weeder rear attachment for a tractor cultivator was effective in finishing the kill of weeds and leveling the soil between corn rows. By use of sweeps and disk hillers and the spring-tooth weeder rear attachment, good control of weeds in drill-planted corn was accomplished without excessive ridging of rows.

Labor and power expenditures were lower with the lister-planter method, but yields were not so good as with the surface-planter method under central Iowa conditions.

A study of the efficiency of the combined harvester-thresher for harvesting grain sorghums (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 55-56).—The work here summarized consisted mainly of storage studies, by F. C. Fenton, as to the ventilation needed for 12 percent moisture grain and moderately damp material and the effectiveness of various ventilation methods.

Electric pig and lamb brooders, W. A. JUNNILA and H. G. McDONALD (*Washington Sta. Pop. Bul. 160 (1941)*, pp. 8, figs. 4).—The pig brooder here described is built into the corner of the pen, having an inside height of 12 in., with front opening of 8 in., and is heated by a 150-w. electric light bulb in a reflector fitted into an opening in the top of the brooder. It is noted that a 200-w. bulb may be used in very cold weather, and that many users keep the

brooder in operation for as much as 2 weeks for one litter, reducing the wattage to 100 after 1 week and later, under favorable weather conditions, to 60 w.

The lamb brooder described is designed upon the same principle, but is shown as built against a side of the enclosure. It is described as 2 by 8 ft., 30 in. high, and heated by 60-w. bulbs placed 2 ft. apart in hemicylindrical tin-plate reflector. A smaller and portable brooder, for individual lambing pens, is also described.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the California Station, 1938-40] (*California Sta. [Blen.] Rpt. 1939-40, pp. 158-166*).—Brief statements are given as to the work on trade barriers between the States, agricultural population and labor, marketing farm products, demand and prices for oranges, marketing of fresh deciduous fruits, and exports of California farm products.

[Investigations in agricultural economics by the Delaware Station, 1940] (*Delaware Sta. Bul. 227 (1940), pp. 6-10*).—Tables are included and discussed showing (1) for Kent County by 5-yr. periods, 1912-38, the average number of farm mortgage loans per year and the average loan per acre, the percentage of loans foreclosed and the percentage of loans lost, and the relationship between purchase price and loan per acre; and (2) the land classification of lands in New Castle County in 1937, as determined by R. O. Bausman and J. E. H. Lafferty, and the size of business—total, tillable, and crop acreages per farm and number of cows and poultry per farm—by land classes. Statements are made as to the age of farmers, time of farmers devoted to employment off their farms, farm experience of farmers, and education of children in the different land classes. A brief statement is made of some of the findings as to consumer's preferences for apples and peaches in Wilmington, based on a study by H. S. Gabriel, in which records were obtained from 197 housewives, 43 restaurants, and 78 stores.

[Investigations in agricultural economics by the Kansas Station, 1938-40]. (Partly coop. U. S. D. A.). (*Kansas Sta. Blen. Rpt. 1939-40, pp. 26-31*).—Brief findings are reported of projects led during the biennium by W. E. Grimes, J. A. Hodges, W. H. Pine, R. J. Doll, H. Howe, M. L. Otto, W. H. Metzger, G. Montgomery, R. J. Eggert, F. L. Parsons, S. W. Decker, and C. P. Wilson on factors affecting the farm income, effectiveness of Federal programs, and hail insurance in central Kansas; the economics of cold-storage locker operations; the marketing of Kansas potatoes and dairy products, including the losses from desiccation, decay, and spoilage in washed and unwashed potatoes, advantages of the pyramid style of loading cars, grades of potatoes and reasons why potatoes failed to grade U. S. No. 1, the competition of other potato-growing areas, method of marketing, etc., found in a study of the Kaw Valley Potato Growers' Association to determine the factors responsible for its successes and failures during the period 1930-36; the cold-storage costs for butter at terminal markets; the gross margins on eggs and poultry; and the effect of size of flocks and heavy and light breeds on the receipts per hen.

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul., 3 (1941), No. 3, pp. 17-18, 23, fig. 1*).—An article on Livestock Now the Most Important Source of Income for North Dakota Farmers, by C. F. Bortfeld, discusses tables and a chart showing by years 1926-39 the gross farm income from crops, livestock, and Government payments and the percentages from each source during the periods 1926-32 and 1933-39. The usual comparisons are made by W. L. Ettesvold of the average prices

received by North Dakota farmers December 15, 1940, with November 1940, December 1939, and the 1910-14 average.

[Investigations in agricultural economics by the South Carolina Station, 1940]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1940, pp. 11-19, figs. 2*).—In addition to the results previously noted, some general findings are given by J. D. Kinard as to the relative percentages of children from tenant and owner homes completing the elementary schools and in high schools, the relative achievement test grade scores of rural and urban children, and percentage of pupils repeating one or more grades in the elementary schools. A chart shows the number of school districts reporting specified amounts of taxable property in 1938.

Tables by W. T. Ferrier and H. A. White are included and discussed showing for the 1939-40 season the average staple length, percentage of cotton below middling grade, discounts assessed in the Augusta market against cotton of the same quality, local prices paid per pound, and the discounts for poor ginning preparations during the 1939 crop season for four selected South Carolina markets. Tables by M. J. Peterson and J. D. Kinard are included and discussed showing some findings as to the changes from 1935 to 1939 in selected items of farm expense and in size of farm business, labor efficiency, rate of production, combination of enterprises, and labor income in Anderson County. Approximately 150 farms were studied in 1935 and 100 were resurveyed in 1939. The farms studied were about equally divided between those participating and those not participating in the Soil Conservation Service program.

[Investigations in agricultural economics by the Wyoming Station, 1940] (*Wyoming Sta. Rpt. 1940, pp. 9-11*).—The formula used in the construction of a table "showing the actual value of Wyoming land for grazing purposes as determined by its value for producing beef at average prices" is presented. General statements, based on management studies in Sheridan and Johnson Counties, are made as to (1) factors affecting return on investment on ranches, (2) labor income of farmers engaged in sugar beet production and in a combination of general crop and livestock farming, and (3) the relative labor incomes of owners and tenants on irrigated farms. A brief statement is also made showing an average labor income of about \$600 for the operator, after allowing \$190 wages for other members of the family, and \$420 for interest on investment on dairy farms in the Star Valley in Lincoln County.

Land ownership and tenure, Huntley irrigation project, P. L. SLAGSVOLD (*Montana Sta. Bul. 385 (1941), pp. 19, figs. 10*).—This study was made to determine the changes in size of farms and tenure on the project from its opening in 1907 and the effects of size and tenure on type of farming. In the analysis the 309 farms studied in 1936 are grouped by size and tenure.

The entry unit on the project was 40 acres. In 1936 approximately one-third of the farms were in the 21-60-acre group and like percentages in the 61-100-acre and over 100-acre groups. Owners operated 118, part owners 61, and renters 130 farms, with total acreages of 8,683, 8,564, and 10,102 acres, respectively. Owners had the highest percentage of sugar beet farms, the lowest percentage of "beet-bean" farms, and the highest percentage of "other" farms. Owners had more livestock per acre. Owners had 48 percent of their available acreage in soil-conserving crops as compared with 43 and 41 percent, respectively, for owner-renters and renters. There was little variation between the groups as to percentage of cropped acreage in feed and cash crops. Owner-renters had the highest percentage of total acreage in pasture. The values per acre of farms and improvements were \$87.70, \$87.38, and \$73.75 and of farm equipment \$5.37, \$4.33, and \$3.72, respectively, for owner-, owner-renter-, and renter-operated farms. The percentages of farms showing a productivity

rating of one or over were 57, 50, and 33, respectively. Eight percent of the owner-renter farms had 75 to 100 percent of fifth-grade land as compared with 16 and 17 percent in the other tenure groups. Mortgages on owner farms had the longest term and lowest rate of interest. The average gross incomes per farm acre were \$35.37, \$30.84, and \$27.70 and per crop acre \$51.18, \$40.58, and \$30.90, respectively, for the owner-, owner-renter-, and renter-operated farms.

A comparison of income and expenses on Farm Security Administration rehabilitation farms with other farms. (Coop. U. S. D. A.). (*Michigan Sta. [Blen.] Rpt. 1939-40, pp. 26-27*).—Comparisons are made of the average labor income, total and tillable acres, number of productive livestock units, and number of productive days work per man per acre on farms of approximately 500 borrowers from the U. S. D. A. Farm Security Administration and on typical farms included in the farm accounting project of the extension service of the Michigan College.

Factors related to low-cost ginning. W. E. PAULSON. (Tex. A. and M. Col.). (*Southwest. Social Sci. Quart., 21 (1940), No. 3, pp. 261-271*).—This paper, delivered at the Cotton Research Congress, held at Waco, Tex., June 27, 1940, was based chiefly on a study by the Texas Experiment Station and discusses the present costs of ginning and how such costs can be reduced.

Wisconsin regulates its growing locker plant industry. M. A. SCHAAERS. (Univ. Wis.). (*Quick Frozen Foods, 3 (1940), No. 2, pp. 21, 32*).—A brief digest is made of the rules and regulations effective September 16, 1940.

Foreign Agriculture, [January 1941] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 5 (1941), No. 1, pp. 30, fig. 1*).—"The present issue inaugurates a new format and editorial policy for *Foreign Agriculture*. It is proposed hereafter to confine the articles in *Foreign Agriculture* to relatively short statements and analyses of current events abroad of interest and significance to American agriculture. In line with this policy it is proposed from time to time to present a general review of foreign developments, with particular reference to their effect on the agricultural export trade of the United States."

Articles are included as follows: (1) World War, Hemisphere Trade, and the American Farmer, by L. A. Wheeler (pp. 3-12), in which the historical background of the agricultural export trade of the United States, the present agricultural export situation, and the Western Hemisphere trade and the farmer are discussed; (2) Rationing in the United Kingdom, by J. H. Richter (pp. 13-24), which "describes the background and operation of the rationing scheme as applied in the United Kingdom and discusses briefly the quantitative restrictions of consumption that the existing rations imply"; and (3) Western Hemisphere Trade in Cotton, 1939-40 (pp. 25-30), including tables showing the exports for the year ended July 31, 1940, by countries of the Western Hemisphere to New World countries, Old World countries, and unclassified countries, and the average exports 1923-24 to 1932-33 and the exports by years 1937-38 to 1939-40 from the principal Western Hemisphere exporting countries to different countries.

International yearbook of agricultural statistics, 1939-40 (*Internat. Inst. Agr. [Roma], Internat. Yearbook Agr. Statis., 1939-40, pp. XLIII+1096*).—This volume continues the series (*E. S. R., 82, p. 124*). A new chapter is devoted to the number and extent of agricultural holdings and their distribution according to size in the various countries. New tables have been added on the output of milk and dairy products and the imports and exports of some seeds, vegetable oils, and oil cake. Several new series of hop and oil cake prices have also been added. The tables are in English and French.

RURAL SOCIOLOGY

[Investigations in rural sociology in Michigan] (*Michigan Sta. [Bien.] Rpt. 1939-40*, pp. 38-39).—Research data presented include local factors influencing the effectiveness of extension work, the extent to which station bulletins are read by those receiving them, and migrant laborers in the sugar beet industry.

Sociological analysis and population research, H. W. BEERS. (Univ. Ky.). (*Social Forces*, 19 (1940), No. 2, pp. 201-207).—Problems discussed are those relating to migration and natural increase.

Arizona's agricultural population, E. D. TETREAU (*Arizona Sta. Tech. Bul. 88* (1940), pp. [2]+43-92, figs. 7).—According to this analysis diverse races have entered into the composition of the agricultural population of Arizona. These were most marked in the resident laborer population, while the migratory laborers were almost all native white. Farm operators were more than 90 percent non-Mexican white, and resident white laborers have penetrated the operator class in larger proportions than laborers of any other color, nativity, or race.

Forty percent of the heads of agricultural households came from Southern States, 35 percent were born in Mexico, 7 percent came from other than Southern States, and 3 percent were foreign-born from European or Oriental countries. The remaining 15 percent were natives of Arizona.

Eighty-three percent of the farm owners in 1928 were farm owners 8 years later, while 6 percent had become farm tenants, 7 percent had dropped back to the laborer stage, and 3.5 percent had gone into other occupations. Among resident laborers, 80 percent were in the same occupation at the close of the period as at its beginning. Between 11 and 12 percent of them moved up the occupational ladder, some to become owners of farms, others to go into other occupations. About 8 percent dropped into the ranks of the unemployed. Seventy percent of the migratory heads of households had at some time been share croppers, tenants, or owners of land. Just one-half of them had operated farms since 1933, and, of these, 47 percent were no longer tenants because of landlord-tenant changes. Financial difficulties, drought, poor health, and old age were in total responsible for fewer changes since 1933 than the one factor of landlord-tenant changes.

The resident Mexican laborer population contained the largest average number of persons per household. One of every four agricultural households was located in a rural town. All but 3 percent of farm operators' households were on farms, but of resident laborers' households only 66 percent were on farms. Migratory laborers' households were largely in private and public camps and on the outskirts of towns. On the whole, whether located on farms or in towns, agricultural households were within 20 min. of the fields where employed.

Rural-farm population in Arizona was strongly male, the sex ratio being from 116 to 100 females as compared with from 111 to 100 throughout the United States. In the four counties whose agricultural population was especially analyzed, the white laborer population contained 119.6 males and 100 females. Among white owners and managers and among tenants, the ratios were 116.5 and 109.4 to each 100 females. Among white migratory laborers there were 126.8 males per 100 females, while in the resident laborer population the ratio was 114.1 per 100. On the other hand, the sex ratio in the Mexican laborer population was 102 to each 100 females.

Agricultural population density in four irrigated areas ranged from 123.8 persons per square mile to 17.5 persons. The man power requirements for

agriculture are numerically supplied by the resident agricultural population excepting during the peak months from September through December. Arizona must to a great extent depend upon its agricultural population as a source of future population growth.

Studies of factors affecting the social well-being of rural people in Kansas. (Coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 31-32).—Population changes during 1938 are summarized by R. C. Hill.

Home town, S. ANDERSON (*New York: Alliance Book Corp.*, [1940], pp. [150, figs. 121]).—Copiously illustrated, this book shows life in the small towns, where the author thinks the real test of democracy will come.

A long-time experiment in local social planning, W. D. NICHOLLS. (Univ. Ky.). (*Rural Sociol.*, 5 (1940), No. 4, pp. 449-453).—The author cites a 20-yr. experiment in community organization, that of Fayette County, Ky., as an instance of long-time social planning.

The challenge to democracy.—I, Democracy on trial, J. A. VIEG (*Iowa Sta. Bul.* P21, n. ser. (1941), pp. 621-636, figs. 3).—This is the first of a series on political science subjects from the rural viewpoint prepared by the department of history and government, Iowa State College.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Contributions of leading Americans to agriculture, edited by A. K. GETMAN and R. W. GREGORY (*Des Moines, Iowa: Meredith Pub. Co.*, 1940, pp. 74, figs. [20]).—This consists of 14 articles published and reprinted for *The Agricultural Education Magazine* as follows: Liberty Hyde Bailey, by H. B. Knapp; Eli Whitney, 1765-1825, by J. T. Wheeler; Cyril George Hopkins, 1866-1919, by B. C. Lawson; William Arnon Henry, 1850-1932, by L. M. Sasman; Thomas Forsyth Hunt, 1862-1927, by F. L. Griffin; Milton Whitney, 1860-1927, by J. A. Linke; Alexander Legge, 1866-1933, by R. H. Woods; Stephen Moulton Babcock, 1843-1931, by H. E. Bradford; Louis John Taber, by L. E. Jackson; Henry Cantwell Wallace, 1866-1924, by R. W. Gregory; Eugene Davenport, by A. W. Nolan; George F. Warren, 1874-1938, by V. B. Hart; Cyrus Hall McCormick, 1809-1884, by A. M. Field; and Gifford Pinchot, by C. S. Anderson.

Livestock marketing, A. A. DOWELL and K. BJORKA (*New York and London: McGraw-Hill Book Co.*, 1941, pp. X+543, figs. 104).—This is primarily a text for use in agricultural colleges but should be a valuable reference for schools of agriculture, high schools, research workers, extension workers, and individuals and organizations engaged in the production, marketing, and distribution of meats. The subject is dealt with in 24 chapters as follows: The livestock marketing problem; livestock supply areas; meat consumption; livestock slaughter; country dealers, concentration yards, and assembly points; public markets; direct marketing; local cooperative shipping associations; cooperative commission agencies at public markets; livestock auctions; transportation of livestock; shrinkage; bruising, death, and crippling; grade standards for livestock and meats; market news and market statistics; livestock prices; price differentials; regulation and supervision of the packing industry and livestock marketing; selling livestock on the basis of guaranteed yield; selling on the basis of carcass grade and weight; cold-storage lockers; wholesale distribution of meats; retail distribution of meat; and looking into the future. Each chapter includes problems for discussion and a list of selected references.

Foods, M. M. JUSTIN, L. O. RUST, and G. E. VAIL (*Boston: Houghton Mifflin Co.*, [1940], rev. ed., pp. XXIV+659, figs. 130).—This revision of a book planned as a text for an introductory college course in foods follows the same plan of organization and presentation of subject matter as adopted for the first

edition (E. S. R., 70, p. 865). The test has been amplified by rewriting, insertion, and enlarging the scope of certain sections to present the developments in recent years.

Effective extension circular letters: How to prepare and use them, II. W. HILBERTSON (*U. S. Dept. Agr., Misc. Pub. 403 (1941), pp. II-43, figs. 27*).—This circular, which is based on a study of letters used by extension workers and businessmen, includes suggestions for county agents, specialists, and supervisors regarding the preparation and use of circular letters. The importance of circular letters, the essentials of letter planning, contents, captions, methods of approach, use of illustrations and slogans, style, appearance, use of arguments and suggestions, etc., are discussed. Three sample letters are analyzed. A check sheet for use in making appraisals of letters is included.

FOODS—HUMAN NUTRITION

[Food and nutrition studies by the Wyoming Station] (*Wyoming Sta. Rpt. 1940, pp. 23-25*).—This progress report (E. S. R., 83, p. 562) includes brief summaries of studies on the effect of cooking on the ascorbic acid content of potatoes, the keeping quality and vitamin C content of home-canned string beans, the reliability of pressure-cooker gages, and basal metabolism of college men.

Fats and oils for cooking and table use, E. F. WHITEMAN and F. B. KING (*U. S. Dept. Agr. Leaflet 204 (1940), pp. 8*).—The relative food value of different fats with respect to their energy and vitamin values and their digestibility; buying guides, including those based on standards and grades proposed by the Agricultural Marketing Service for butter; retail market units and cost; uses; and the care of fats are discussed briefly in this leaflet.

Potato consumption and dietetic value in 1938 and 1939, C. H. METZGER (*Colo. State Col.*). (*Amer. Potato Jour., 18 (1941), No. 1, pp. 10-19*).—This report consists of a review of some of the recent literature on disposition, composition, and various uses of the potato. Fifty-one references are given.

The blackening of cooked potatoes, H. NUTTING and M. C. PRUND (*Cornell Univ.*). (*Science, 92 (1940), No. 2390, p. 356*).—This brief note points out that the blackening of cooked potatoes is a different process from the darkening that occurs when raw peeled potatoes are exposed to air. The latter is an oxidation process in which melanin is synthesized under enzymic activity. The former process, also one of oxidation, does not involve enzyme activity, since potatoes which did not darken when kept in an atmosphere of nitrogen during boiling and cooling blackened when removed to the air. "Certain properties, including the ultraviolet absorption spectra of the pigments from the darkened raw and cooked potatoes, were compared. Those of the blackened cooked portions differed markedly from the melanin and, moreover, showed properties similar to flavones."

Cooking quality in rice and a preliminary method for testing nursery samples, N. E. JODON and J. M. JENKINS (*U. S. D. A. and La. Expt. Sta.*). (*Rice Jour., 43 (1940), No. 6, pp. 9-10*).—Tenderness and flaky structure, the most important factors in table quality in rice, are properties not associated with high yield or unbroken kernels. Varieties that are flaky when boiled appear to have less compactness and uniformity of structure of starch in the endosperm than do varieties that are pasty when cooked. The former tend, therefore, to break more than the latter in milling. Cooking quality is probably independent of grain length, but of the present varieties on the American market the best ones from the standpoint of cooking quality are all of the long-grain type. For prompt detection and elimination of selected strains of rice having undesirable texture and flavor a simple method is proposed. This involves simultaneous

cooking tests of a number of 25- or 30-gm. samples of milled rice, each sample being placed in an aluminum "coffee ball" about $2\frac{1}{4}$ in. in diameter and $2\frac{1}{2}$ in. high without the cover. In making the test, eight of the coffee balls are placed on a wire rack adjusted to come 1 in. above the bottom of the covered kettle. When the salted water, which is filled to a level $\frac{1}{2}$ in. below the top of the containers, comes to a rolling boil, the containers are submerged. After from 18 to 20 min. of boiling, the water is poured off to a level below the rack and steaming is continued for 5 min. As an alternative, boiling may be reduced to from 12 to 15 min. and steaming extended to 15 min. The appearance of the boiled samples is an indication of texture. A firm mold of cooked rice with minimum expansion and glossy appearance indicates a pasty texture, while a mold with maximum expansion and flaky texture, easily broken upon removal, indicates a desirable texture. Odors may be most easily detected when the samples are removed from the containers.

Taro (*Colocasia esculenta*) as a food, M. PORGIETER. (Hawaii Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 6, pp. 536-540).—This paper, the first of a series of three, presents a general survey of the value of the taro as a food, and reviews a number of studies on its composition and nutritive value, its use (particularly in Hawaii), and its utilization in new taro products. Because of its contribution of calcium and vitamin B₁, increased use of the taro in preference to other and less nutritious carbohydrate foods is recommended as desirable in certain localities where the taro may be grown successfully and where the native diet may be limited. Twenty-nine references are given.

The utilization of the calcium and phosphorus of taro by young rats, M. PORGIETER. (Hawaii Expt. Sta. and U. S. D. A.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 7, pp. 670-673).—This paper, the second of the series, presents the results of paired feeding experiments conducted over an 8-week period in which the test rats received a complete diet containing 67.4 percent of taro flour, an amount sufficient to furnish 97 percent of the calcium and 58 percent of the phosphorus of the diet. In the diet for the control animals the taro flour was replaced by cornstarch and soluble inorganic calcium and phosphorus salts in amounts essentially equivalent to those furnished by the taro. Calcium and phosphorus retentions were calculated from calcium and phosphorus intakes and total calcium excretion. On the taro diet the total intake per rat averaged 0.424 gm. of calcium and 2.037 gm. of phosphorus, while average retentions amounted to 82 and 18 percent of these respective intakes. On the control diet with average total intakes of 0.584 and 2.300 gm. of calcium and phosphorus, respectively, the retentions amounted to 88 and 20 percent, respectively. The average content of body calcium, as determined by analyses of the eviscerated animals was 0.693 and 0.890 gm. for the taro and control groups, respectively; the respective average phosphorus contents were 0.0645 and 0.753 gm.

Comparing the percentage retentions, it appeared that the calcium and likewise the phosphorus of the taro diet were about 90 percent as well utilized as the calcium and phosphorus of the control diet. On both diets, however, the quantity of phosphorus retained might have been obtained from that part of the dietary phosphorus unavoidably furnished by the casein and yeast of the diet rather than by the taro or the inorganic salts.

The utilization of the calcium and phosphorus of taro by young women, M. PORGIETER. (Hawaii Expt. Sta. and U. S. D. A.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 9, pp. 898-904).—This third paper presents the results of calcium and phosphorus balance studies conducted on two healthy women subjects, one a Caucasian (63 kg.) and one a Japanese (41 kg.), on two diets, one high in taro and one high in white rice, but otherwise identical and calculated to meet the caloric needs of the subjects. As determined by analyses of the

composite diets, the taro diet furnished about 4 percent more than the average minimum requirement for calcium (6.4 mg. per kilogram of body weight) and 40 percent more than the average minimum requirement for phosphorus (12.6 mg. per kilogram), while the rice diet furnished only about 30 percent of the requirement for calcium and a little more than the requirement for phosphorus. The taro, eaten as poi, furnished about 80 percent of the calcium and 40 percent of the phosphorus in the first diet, while rice furnished about 30 percent of the calcium and 35 percent of the phosphorus in the second diet. The experimental procedure is noted and the balance data, as well as information on the nature and nutritive value of the diets, are given in detail. The data, showing that both subjects had a near-equilibrium average balance for the whole taro period, indicated that they were getting very nearly the minimum calcium for equilibrium and that the calcium of the taro was, therefore, being well utilized by these adult women. Since both subjects were in positive phosphorus balance, it appeared that the phosphorus of taro was also relatively well utilized. On the rice diet the Japanese subject was capable of maintaining calcium equilibrium on the low intake of 0.091 gm. per day (0.0022 gm. per kilogram), whereas the calcium balance of the Caucasian subject was -0.133 gm. per day. The phosphorus of the high rice diet was well utilized by both subjects. "The need for additional calcium balance experiments on Oriental and Caucasian subjects seems indicated."

The preparation and freezing of certain vegetables in lockers, C. DuBois and D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Refrig. Engin.*, 39 (1940), No. 2, pp. 107-108).—A study was made of proper blanching periods and media in the preparation for freezing of beets, beet greens, Swiss chard, kale, curly mustard, kohlrabi, carrots, New Zealand spinach, turnips, turnip greens, and green shell beans. In some cases a comparison was made of dry and brine packs. Hot water and steam served as the scalding mediums, and the minimum length of treatment in the various trials was sufficient to inactivate catalase and peroxidase, as determined by methods noted. The blanched vegetables, cooled, packaged, frozen, and stored, were examined after the experimental packs had been in storage at 0° to -10° F. for 6-9 mo. The results as summarized indicate the variety of each vegetable tested, the most desirable maturity for use in the frozen vegetable pack, and the optimum scalding periods for blanching with boiling water or with steam. The period required for blanching any given vegetable in live steam was approximately 50 percent greater than that needed for scalding in boiling water. It is noted that the quality of all the frozen products, both steam- and water-blanched and dry- and brine-packed, was very good except for kale and New Zealand spinach, neither of which gave desirable products. Brine-packed vegetables did not desiccate in storage and were of good flavor, but the brine added weight and necessitated the use of water-tight containers.

Factors influencing the keeping quality of frozen foods, M. A. JOSLYN. (Univ. Calif.). (*Ice and Refrig.*, 39 (1940), No. 1, pp. 63-65).—This address is concerned with the nature of changes in solidly frozen food during storage and the predisposing factors to these changes. The growth of ice crystals, temperature equilibrium and desiccation, and chemical changes, such as oxidation and changes in enzyme systems, are considered in particular.

Further studies on development of *Clostridium botulinum* in refrigerated foods, F. W. TANNER, P. R. BEAMER, and C. J. RICKHER. (Univ. Ill.). (*Food Res.*, 5 (1940), No. 4, pp. 323-333).—Peas, asparagus, green beans, spinach, sausage, and ground beef, non-acid foods with a $\text{pH} > 4.5$, and black raspberries, cherries, and peaches, acid foods with $\text{pH} < 4.5$, were given a heavy inoculation

of detoxified spores of *C. botulinum* and then frozen. The inoculation was much heavier than would probably ever be found in the regular product. After from 2 to 3 hr. in the freezing chamber the containers were placed in controlled incubators to thaw and incubate. Control portions of uninoculated fresh foods were similarly handled. Samples held at 5°, 10°, 15°, 20°, and 37° C. were tested after 4 and 14 days for the development of toxin. The presence of toxin in a food was determined by feeding 1 cc. of the prepared food emulsion to a healthy 250-gm. guinea pig. The results, which are tabulated, showed that toxin production occurred consistently in foods inoculated and stored at 37°. In general the toxin occurred in foods more alkaline than pH 4.5 stored at 20° and 15°. Occasionally toxin production occurred in non-acid foods at 10°. Inoculated frozen foods, both acid and non-acid, when stored at 5° were not toxic after 14 days. In certain samples of acid foods the reaction was altered to be more alkaline than pH 4.5, due to the action of contaminating molds, and in these samples toxin developed. The findings indicate in general that *C. botulinum* may sometimes develop and produce toxin in frozen foods which have thawed and been stored at 10° or above, but that frozen foods properly handled and kept frozen until used are probably as safe and satisfactory as fresh foods.

The sanitization of dishes, W. L. MALLMANN. (Mich. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 8, pp. 779-786, fig. 1).—This address summarizes certain findings by the author and others with regard to the effectiveness of dishwashing procedures, as practiced in public restaurants, in adequately sanitizing dishes. Bacteriological examination of swab cultures of various eating utensils in establishments washing dishes by machine, by approved and by nonapproved methods, showed that wash water at 120° F. gave the most effective action; that detergents because of variable low concentration cannot be depended upon for supplying germicidal action; and that rinse waters should be at temperatures of 180° or higher in contrast to temperatures from 110° to 130° as found in use in many restaurants. Recommendations toward proper sanitization include the use of preflushers to avoid introduction of waste material into the wash compartments of machines; the use of detergent dispensers; the avoidance of film produced by hard waters or detergents not suitable for these waters; proper stacking of dishes to avoid overpacking of trays; adequate supplies of hot water, with thermometers for checking the temperatures of wash and rinse waters; regular checking of machines to see that spray nozzles are not plugged; avoidance of toweling; and finally, regular bacteriological examination of swab cultures of dishes as a check on bacterial counts which should be below 100 per unit.

[Food consumption studies of the South Carolina Station], A. M. MOSES (*South Carolina Sta. Rpt. 1940*, pp. 22-25).—In this progress report the comparison of the food consumption records for farm families in three sections of the State (E. S. R., 83, p. 562) has been extended to a tabulation of the number and percentage of weekly food records for white and Negro families in each section graded good, fair, and poor, with a further separation of the records for the white families into diets having per capita weekly money values of less than \$1.90 and \$1.90 or more.

A preliminary report is also given of a survey of the year's food supply of 136 rural white families of one of the counties of the State, with emphasis on problems involved in the home production of sufficient vegetables for home consumption throughout the year.

[Nutrition studies by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1939-40*, pp. 128-129).—In this progress report (E. S. R., 80, p. 848) the general findings are noted of a comparison by M. T. Harman of crystalline ascorbic acid

(Cebione), orange juice, and sprouted oats as a source of vitamin C for guinea pigs, and by M. S. Pittman and D. Cederquist of the dietary habits of girls in high school and in lower and upper college classes.

Flavoring baked goods by absorption (*California Sta. [Bien.] Rpt. 1939-40, p. 149*).—To avoid losses of flavor in baked goods from volatilization of the flavoring agent during baking it is suggested that the flavoring material, instead of being added to the product before baking, be placed in a small open vessel, together with the baked goods, in a sealed container for from a few minutes to a few hours after baking. Under such conditions the baked goods have been found to absorb flavors satisfactorily.

What is flavor? F. W. FABIAN. (Mich. State Col.). (*Canner, 91 (1940), Nos. 2, pp. 12-13, 20, figs. 3; 3, pp. 13-15, figs. 2*).—This address considers the anatomy and physiology involved in taste and smell, as well as the chemical and physical factors. Sweetness and bitterness in taste, and odors classified as spicy, flowery, fruity, resinous, burnt, and foul, are considered in relation to flavor, and certain practical illustrations are given.

Basal secretion of digestive enzymes in old age, J. MEYER, E. SPIER, and F. NEUWELT (*Arch. Int. Med., 65 (1940), No. 1, pp. 171-177, figs. 5*).—The activity under fasting conditions of the enzymes in saliva, gastric juice, and duodenal juice was tested by several of the newer enzyme methods for 32 subjects between 12 and 60 yr. of age and 29 subjects between 60 and 96 yr. The results, as shown by scatter diagrams, indicate a downward trend in salivary ptyalin with increasing age beyond 60 yr. and slightly subnormal values for pancreatic amylase; a sharp fall in pepsin in the 61- to 80-yr. group to rather constant low levels; and a sharp fall in trypsin after the fortieth year. Pancreatic lipase values were variable and independent of the gastric acidity and age of the subjects. The average values for all enzymes were lower for female than male subjects at all of the ages tested.

Blood sugar studies on golfers, P. MICHAEL (*Jour. Amer. Med. Assoc., 115 (1940), No. 4, pp. 286, 287, figs. 2*).—Blood sugar studies were made on 30 healthy male golfers ranging from 30 to 45 yr. of age and having handicaps of from 10 to 27. The blood specimens were taken before and after lunch and thereafter at every odd-numbered hole for the entire round. Composite average blood sugar curves are given for a foursome taking 3 hr. and a twosome taking 2½ hr. to complete. In both cases there was an elapsed time of 20 min. between the end of lunch and starting play. The customary postprandial rise in blood sugar reached its peak at the fifth hole in the foursome and the seventh in the twosome, after which the blood sugar dropped to hypoglycemic levels between the ninth and fifteenth and the eleventh and fifteenth holes, respectively. These periods corresponded to the greatest fatigue and lessened efficiency, which were more pronounced in the more nervous and less accomplished golfers than in the more composed and better players.

It is suggested that the period of hypoglycemia may be combated by a more ketogenic type of lunch and the consumption of sugar or candy near the eighth hole in the foursome and the ninth in the twosome. When these suggestions were followed, the blood sugar levels did not reach such low figures and fewer signs of fatigue were evident.

The basal metabolism of obese children, N. B. TALBOT and J. WORCESTER (*Jour. Ped., 16 (1940), No. 2, pp. 146-150*).—Earlier work (E. S. R., 84, p. 273) related basal metabolism to creatinine excretion as a measure of the heat production of the active protoplasmic mass (muscle). In an extension of this work, determination of the creatinine coefficient (creatinine output in milligrams divided by weight in kilograms) in obese children showed it to be 40 percent lower than in two normal children, indicating that although the

fat child has approximately normal musculature for his height, he has 40 percent less heat-producing tissue per kilogram of body weight than the normal child. This background explains the difference in metabolic rates by the creatinine standard (+14 percent) and the weight standard (-4.1 percent). On the basis of the creatinine standard it appears that the active protoplasmic mass was producing heat at an accelerated rate in the obese children. On the basis of the weight standard, however, it appears that these children were producing slightly less than the average amount of heat for their total mass. These views are reconcilable in that the heat-producing tissues had apparently been stimulated to produce more heat in order that the energy requirements of the body as a whole (represented by weight) might be met. It is considered, therefore, that the creatinine standard of metabolism gives a truer picture of energy metabolism in the obese child than other standards which do not take the active protoplasmic mass into account. Judged by the creatinine standard, it would seem that fat boys and girls (of the constitutional type described) do not necessarily suffer from a deficiency of anterior pituitary or thyroid hormones.

The utilization of calcium in carrots, lettuce, and string beans in comparison with the calcium in milk, J. B. SHIELDS, B. W. FAIRBANKS, G. H. BERRYMAN, and H. H. MITCHELL (Univ. Ill.). (*Jour. Nutr.*, 20 (1940), No. 3, pp. 263-278).—In the 10 experiments reported young rats on a basal diet liberally provided with protein, vitamins, and minerals other than calcium and phosphorus received supplements of the test foods sufficient to provide only 4-7 mg. of calcium per gram of gain (10 mg. per gram of gain being required for maximum calcification). The calcium intakes and gains in body weight were equalized among the comparable animals of the trios or pairs, and after feeding periods sufficient to permit 100-gm. gains in weight the calcium retentions were determined by carcass analysis. The average results of the various experiments comparing the calcium of commercial skim milk powder ("dry milk solids") with that of liquid skim milk and of carrots (raw and cooked), lettuce, and green string beans (raw and cooked) are reported and discussed in detail.

The results indicate that the commercial desiccation of milk does not appreciably impair the value of its calcium in the nutrition of growing animals, and in these experiments the calcium of fresh carrots, fresh lettuce, and fresh green string beans was only 85, 80, and 74 percent, respectively, as available as the calcium of milk. The steaming of the carrots and the commercial canning of the string beans did not significantly affect the availability of the calcium. It is considered that "the constituents of vegetables tend to depress the utilization of the calcium of other foods with which they are fed. The maximum extent of this effect may be determined by the extent to which the calcium of the vegetable, when fed as the sole source of calcium, is utilized in comparison with the calcium of milk."

The effect of acute magnesium deficiency on bone formation in rats, J. DUCKWORTH, W. GORDEN, and G. M. WARNOCK (*Biochem. Jour.*, 34 (1940), No. 1, pp. 97-108, fig. 1).—A Mg-deficient diet containing not more than 6 p. p. m. of Mg, as determined by spectrographic analysis, was prepared, by methods noted in detail, from casein, starch, butterfat, an inorganic salt mixture, a 50-percent alcoholic extract of yeast, and Radiostoleum. When supplemented with Mg, this diet could support normal growth and reproduction; upon omission of the wheat-germ oil component from the Mg-supplemented diet growth but not reproduction was satisfactory.

Litter-mate pairs of rats were allotted, respectively, the Mg-deficient and Mg-adequate diets, and were continued on the experiment until the rat on the deficient diet died, when the corresponding litter mate was killed. Animals

on the Mg-deficient diet failed to grow normally, growth ceasing after about 4 days; beyond this, weights tended to decline and none of the animals survived longer than 23 days. Restitution of Mg after 6 days on the deficient diet produced almost normal growth. Compared with normal controls, the animals surviving for longer periods on the Mg-deficient diet showed decreased calcification of the organic matrix of the bone as evidenced by lower ash and Mg content. About one-third of the skeletal Mg was lost during the first 6 days; continued reduction, however, was not proportional to the length of the survival period. It is concluded, therefore, that only about one-third of the skeletal Mg can be easily mobilized by the soft tissues. Aside from the lower percentage of Mg the skeletal ash of the test animals usually showed a higher percentage of Ca than that of the controls, but no significant difference in P.

Restitution of Mg to the diet resulted in greater deposition of Mg in relation to Ca than was required for formation of normal bone salt. This is interpreted as deposition to replenish the partially exhausted reserve.

Metabolism of iron (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 4, pp. 305, 306).—Editorial comment on the reports of Hahn et al. (E. S. R., 82, p. 703) on the use of radioactive iron in iron metabolism studies.

Available iron in fish, K. C. SAHA and B. C. GUHA (*Indian Jour. Med. Res.*, 27 (1940), No. 4, pp. 877-886, fig. 1).—Fish tissue previously hydrolyzed by pepsin or trypsin gave higher values than untreated tissues in determinations of ionizable ("available") iron by the Hill method involving reduction of the digest or extract with sodium hydrosulfite and treatment with α - α' -dipyridyl. This is taken as indication that some of the iron present in fish tissue exists in an iron-protein complex which, as such, does not react with α - α' -dipyridyl, but which may be readily hydrolyzed by pepsin or trypsin and is, therefore, nutritionally available. Peptic digestion was found to give considerably higher values than tryptic digestion. Extraction of the nonproteolyzed tissue with acetate buffer (pH 5.5), as in the Hill method, failed to remove the iron-protein complex, apparently because the buffering systems of the tissues themselves predominated over that of the added buffer, bringing the mixture to a nearly neutral reaction. Addition of 10 percent acetic acid, however, maintained a medium sufficiently acid to permit the liberation of that portion of the iron which was in simple chemical combination. This treatment served as a good alternative to the enzymic procedure. Available iron, determined after peptic digestion or acid hydrolysis in nine species of fish, ranged from 0.13 to 1.38 mg. per 100 gm. of tissue. During egg formation the available iron content of the fish muscle was found to be greatly decreased, while the iron was found concentrated in the roe. In the five fish tested, iron in the muscle (after peptic digestion) ranged from 0.18 to 0.63 mg. per 100 gm., while that in the roe ranged from 0.48 to 1.85 mg. per 100 gm.; muscle tissue of the non-egg-bearing fish ranged from 0.72 to 1.32 mg. of available iron per 100 gm. of tissue.

Amino acids and hemoglobin production in anemia, G. H. WHIPPLE and F. S. ROSSIGNET-ROBBINS (*Jour. Expt. Med.*, 71 (1940), No. 4, pp. 569-583).—This paper reports the results of studies conducted over a number of years on the net hemoglobin production effected by individual amino acids fed to well-standardized anemic dogs. The amino acids, fed for 2-week periods, were given at levels varying from 0.5 to 5.0 gm. per daily dose. The net hemoglobin production was estimated as the production over and above that on the control base diet of standard salmon bread. The daily iron intake from the standard bread fed at different levels varied from 5 or 6 mg. to a maximum of 30 or 40 mg., this variation being introduced to indicate that iron was not the limiting factor in these experiments.

Of the various amino acid doses given, 1 gm. per day seemed to be the optimum intake in most cases for a 2-week period. Larger doses rarely increased the output of hemoglobin, but smaller doses in some experiments decreased the output. Twenty-two amino acids were tested, the results showing that these can be utilized singly in the complex reaction related to hemoglobin building. The average hemoglobin production due to an amino acid averaged about 25-30 percent of that due to a standard intake of liver (13 gm. of hemoglobin per 100 gm. of liver). Of the amino acids tested, 15 have been found in hemoglobin, making up 71 percent of its protein. Seven of these, leucine, isoleucine, histidine, lysine, phenylalanine, tryptophan, and arginine, have been listed by Rose (E. S. R., 79, p. 133) as essential for growth. These amino acids were no more potent than the others in their capacity to promote hemoglobin production in the experiments with dogs made anemic due to blood loss.

Endemic fluorosis and dental caries (*Jour. Amer. Dent. Assoc.*, 27 (1940), No. 7, pp. 1115-1118).—This editorial expresses the view that the use of fluorides for retardation of decay is a questionable practice that does not meet with the approval of the dental profession. "Although it has been fairly well determined that fluorine has a slightly retarding influence on the progress of dental caries, it has also been definitely shown that the deleterious influence of ingestion of fluorides on the structures of the teeth, particularly the enamel, of the child at a period when the permanent tooth tissues are in the developmental process is too serious to be counterbalanced by its questionable caries-retarding influence at a later period."

The fluorine and dental caries problem, G. J. Cox (*Jour. Amer. Dent. Assoc.*, 27 (1940), No. 7, pp. 1107-1114).—This is a review bearing on the ingestion of fluorine as the cause of mottled enamel; on the effect of fluorine in reducing the incidence of dental caries; and on the influence of fluorine in the alteration of enamel structure.

Fluorides in food and drinking water: A comparison of effects of water-ingested versus food-ingested sodium fluoride, F. J. McCURE (*U. S. Pub. Health Serv., Natl. Inst. Health Bul.* 172 (1939), pp. V+53, pls. 9, figs. 3).—Chronic fluorosis as produced by water- or food-ingested sodium fluoride was studied in young rats. The animals were observed in feeding experiments in which food and water consumption were carefully controlled so that fluorine intake from food in the one series equaled that from fluorine-containing waters (22.6, 45.2, and 90.4 p. p. m.) in the other series. The effects of water- and food-ingested fluorine were compared, using as criteria (1) average daily weight gain, (2) ash and fluorine content of bones and teeth, (3) the appearance of the teeth, and (4) the total fluorine contained in the final body weight.

On the basis of these observations, reported in detail, no noticeable differences could be attributed to the two mediums of fluoride ingestion. Balance studies on the rats indicated that the average total retention of fluorine from sodium fluoride may equal 30-40 percent of the total intake at the concentrations studied, and that the greater part of this is deposited in bones and teeth. The degree of tooth hypoplasia was directly correlated with the quantity of fluorine present. It was observed further that sodium fluoride at a level of 45 p. p. m. or more of fluorine in food and water effects a reduced rate of weight gain; that an increase in bone ash occurs from the sodium fluoride ingestion levels equaling 22.6-600 p. p. m. of fluorine, and that 0.03-0.04 percent of fluorine is about the maximum that may be present in the whole tooth and still permit the tooth enamel to retain its normal macroscopic appearance. These results with rats are considered to suggest that fluorine may accumulate in the bones of

adults living in areas where mottled enamel is endemic. The quantities of fluorine in a large number of foods are summarized from the literature.

Observations on the durability of mottled teeth, M. C. and H. V. SMITH. (Univ. Ariz.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 9, pp. 1050-1052, fig. 1).—The results of a dental survey of the mottled teeth of inhabitants of Saint David, Ariz., where water supplies range from 1.6 to 4.0 p. p. m. of F, are presented graphically. In the age group from 12 to 14 yr. 33 percent of the children showed carious lesions. Beyond this age the percentage of persons with carious lesions increased, and among those 21 yr. of age and older there were relatively few individuals in whom caries had not developed. Because of failure of fillings to anchor in carious mottled teeth, extractions were necessary in many cases. The survey showed that in the 15- to 17-yr. age group about 22 percent had had extractions for this reason. This percentage increased rapidly and 70 percent or more of all persons in all age groups from 24 to 26 yr. and beyond had had such extractions. That decay was widespread and repair highly unsuccessful among the young adults was shown by an incidence of more than 50 percent of false teeth in the age group from 24 to 26 yr. This high incidence of false teeth appeared in all subsequent age groups. Although mottled teeth may be somewhat more resistant to the onset of decay, still they are structurally weak as observed in the present survey, and when decay does set in the result is often disastrous. A word of warning is given, therefore, as to the danger of attempting to build caries resistance into teeth by the addition of fluorides to public water supplies.

A "refresher course" on the vitamins, P. W. ALLEN. (Univ. Tenn.). (*Canad. Dairy and Ice Cream Jour.*, 19 (1940), No. 6, pp. 32, 34, 42).—This is a brief review written in popular style, and with emphasis on the vitamin contribution of milk.

Some recent advances in vitamin therapy: Clinical lecture at New York session, T. D. SPIES, D. P. HIGHTOWER, and L. H. HUBBARD (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 4, pp. 292-297, fig. 1).—This report is confined to advances which have been made in the therapy of vitamin deficiency diseases since 1936. The review is presented chronologically, with emphasis in 1936 on advances in vitamin B₁ therapy following the synthesis of the vitamin as thiamin chloride; in 1937-38 on the isolation of nicotinic acid amide from liver concentrates as marking a milestone of progress in the study of pellagra; in 1938-39 on the discovery of the importance of riboflavin in human nutrition, with the recognition of cheilosis as a typical manifestation of riboflavin deficiency; in 1939-40 on vitamin K in its relation to the prothrombin of the blood and vitamin B₆ (pyridoxin) in its effect on various diseases; and in 1940 on vitamin E in its relation to muscular dystrophy, on yeast adenylic acid in the treatment of cases of obscure deficiency diseases, and on pantothenic acid in relation to blood, urine, and tissues. A discussion is included of the factors operating to produce and to correct deficiency conditions and of the principles of general and specific therapy, with suggested doses of the various vitamins. It is noted in conclusion that the authors' studies indicate that many people have a mixed rather than a single deficiency disease and that from a practical standpoint mixed vitamin therapy is often desirable. "We recommend the administration of water-soluble vitamins together, rather than individually, as having a definite usefulness in the treatment of deficiency diseases. Even when specific therapeutic agents are administered in the treatment of deficiency diseases, persons of all ages should also be given a well balanced, high caloric diet."

Experimental avitaminosis in man [trans. title], K. H. WAGNER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 264 (1940), No. 3-4, pp. 153-188, figs. 9).—

Ten subjects were observed on a diet practically free of vitamin A or β -carotene over a period of 293 days. After 188 days various signs of deficiency were noted. In particular, dark adaptation measurements at definite intervals over a 48-min. test period showed decreased sensitivity as compared with normal subjects; with the Nagel adaptometer arbitrary values of 3,500–6,000 were obtained for the experimental subjects as compared with an average value of 130,000 for 20 normal controls. Moreover, improvement in observed sensitivity (adaptometer readings) over the test period was represented by a range of only 200 adaptometer units in the vitamin A-deficient subjects in contrast to a normal range of 6,500. In the visual field there was inversion and contraction of the red and the blue, although this was not a constant sign of vitamin A deficiency as was the shifting of the yellow (both nasal and temporal) to within the limits of the field of vision for the green. Other signs observed in all of the experimental subjects were pronounced weight loss (0–8 kg.) after 6 mo., a fall in hemoglobin and in red cell count, together with poikilocytosis, and anisocytosis. Leukopenia, associated especially with degenerative cells of the myelocyte series, and a decrease in the platelet count (from a normal of 400,000–500,000 to a minimum of 30,000) were also observed.

The vitamin requirement, as determined by the daily dosage necessary to maintain normal adaptation, normal visual field, rising blood values, and normal weight curves in the majority of cases over a prolonged period (April 17 to July 31 in the present study), was observed in 10 subjects on the vitamin A-deficient diet, 5 of the subjects receiving β -carotene, the other 5 vitamin A (Vogan). In these tests the minimum daily human requirement was determined as 2,000 International Units of vitamin A (2,500 I. U. recommended for a safe allowance), or 5,000 I. U. (3,000 γ) of β -carotene.

Wheat kernel from standpoint of vitaminization, C. H. BAILEY. (Univ. Minn.). (*Southwest. Miller*, 19 (1940), No. 43, pp. 19, 38).—In this address before the Millers National Federation the author discusses the problems involved in the proposed enrichment of flour with thiamin, nicotinic acid, riboflavin, iron, and possibly calcium from the standpoint of the content of these constituents in wheat and its various milling products and the means that can be used to increase the content of each to the desired level.

Hormones and vitamins in cosmetics, J. J. ELLER and S. WOLFF (*Jour. Amer. Med. Assoc.*, 114 (1940), Nos. 19, pp. 1865–1875; 20, pp. 2002–2010).—The margin of safety and the efficacy of hormones and vitamins when used in cosmetics are matters to be determined now that such preparations are being marketed and are receiving uncontrolled use. Published studies pertinent to these matters are reviewed and summarized in the present article. Experiments cited indicate that androgens and oestrogens can be absorbed through the intact skin and may cause effects similar to those observed after injection or ingestion of the substances. Since these hormones absorbed through the skin may exert a profound influence on the anterior hypophysis and the ovaries and since animal experiments have demonstrated that sex hormones can induce cell proliferation frequently amounting to cancer in the tissues they affect, it is concluded that there is potential danger to normal persons who use cosmetics containing these active therapeutic substances. "While it may be true that vitamin A and D can be absorbed through the unbroken skin, there is no conclusive evidence that they affect the local tissues. It is questionable whether the small amount of vitamins that could be absorbed from cosmetics would produce any systemic effects in human beings. Vitamins in soaps are of questionable value because of the small quantity of vitamins in the soap solution and the brief interval of contact with the skin."

Vitamin A status of children as determined by dark adaptation, J. M. LEWIS and C. HAIG (*Jour. Ped.*, 16 (1940), No. 3, pp. 285-296, figs. 3).—Using the same apparatus and essentially the same procedure as employed in the previous study on infants (*E. S. R.*, 83, p. 849), minimum light thresholds after complete dark adaptation (i. e., final rod thresholds) were determined in 144 children ranging in age from 6 to 12 yr. The final rod threshold level was used as a criterion, since it shows definite elevation in vitamin A deficiency. Sixteen of the children studied were private patients (normal children from fairly well-to-do homes), but the remainder, observed either in the wards or in the outpatient department of Bellevue Hospital, New York City, were mostly from very poor homes. The children suffered from various conditions, involving febrile states in many cases.

Dark adaptation tests revealed normal threshold values (ranging from 1.6 to 2.5 log micromicrolamberts) in all but one case, that of a child tested after 2 weeks on a rigorous diet which was low in vitamin A. "Administration of 120,000 units of vitamin A in the form of percomorph-liver oil brought about a fall of the threshold to a normal value in 35 min. The effect of this enormous dose lasted 24 days, at the end of which time the threshold again reached an abnormally high level. The provitamin carotene (120,000 units) was then given and a prompt response was again noted, the threshold returning to normal in 32 min. This child was then placed on a regular diet, and repeated tests over a period of several months have revealed normal values." These studies indicate that vitamin A deficiency, as judged by dark adaptation, is an uncommon disorder in children in New York City.

Vitamin B complex, C. A. ELVEHJEM and H. A. WAIMAN. (*Univ. Wis.*). (*Natl. Livestock and Meat Bd. Rpt.*, 17 (1940), pp. 37, 38, 39, 48, figs. 5).—This is a brief summary of the published (*E. S. R.*, 84, p. 563) and unpublished studies of the author and associates on the distribution of the various vitamins of the B complex in meat and meat products.

The vitamin B complex in normal nutrition, C. A. ELVEHJEM. (*Univ. Wis.*). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 7, pp. 646-654, fig. 1; also in *Med. Woman's Jour.*, 47 (1940), No. 10, pp. 304-309, fig. 1).—In this address thiamin, riboflavin, nicotinic acid, vitamin B₆, and pantothenic acid are described as to function, requirement, and distribution in natural foodstuffs. The nutritional value of the individual synthetic vitamins is then considered in comparison with their value in food sources, and finally the question of fortification of foods with vitamins is discussed, with the conclusion that caution should be taken not to introduce one vitamin out of all proportion to the others. Experiments with chicks are cited showing successive improvement in growth on a vitamin B complex-deficient diet with successive additions of vitamin B₁, flavin, nicotinic acid, vitamin B₆, and pantothenic acid, but still better growth with the substitution of real liver or beef kidney for all of these factors.

Further studies on the vitamin B₁ and B₂ content of dry yeasts grown on media containing xylose [trans. title], A. SOHRENET and K. H. WAGNER (*Biochem. Ztschr.*, 303 (1940), No. 5-6, pp. 329-334, figs. 4).—Dry yeasts (*Torula utilis*), cultured in technical processes on various basic media containing *d*-xylose or on distillery waste, were studied for their content of vitamins B₁ and B₂ (complex), the assays being made by rat-growth procedures which are outlined. The vitamin B₁ content varied from 500 to 800 International Units per 100 gm., while the vitamin B₂ content varied from 1,333 to 2,000 Bourquin-Sherman units per 100 gm.

Adrenal cortex and phosphorylation of vitamin B₁, S. OCHOA and R. J. ROSSIER (*Jour. Physiol.*, 97 (1940), No. 3, pp. 1P, 2P).—In this preliminary report evidence is presented from tests on rats, using the method of Ochoa and

Peters (E. S. R., 82, p. 278), leading to the conclusion that, "even in extreme adrenal cortical insufficiency, direct determinations of cocarboxylase offer no evidence for the theory that the adrenal cortical hormone is necessary for the phosphorylation of vitamin B₁."

Aneurin in spinal fluid [trans. title], G. SÄKER (*Klin. Wchnschr.*, 19 (1940), No. 5, pp. 99-102).—Vitamin B₁, determined by the *Phycomyces* method of Guhr (E. S. R., 83, p. 280) in the spinal fluid of 29 subjects including normal and diseased persons, was found to vary from none to traces to as high as 18.5γ percent. This wide variation appeared to bear no relation to the concentration of the vitamin in the blood or to the diseased condition. Further, the vitamin B₁ content of the spinal fluid appeared to bear no physiological relation to the aneurin requirement of the central nervous system. Comparison and evaluation of the saturation curves of blood and spinal fluid following intravenous injection of 50 mg. of the vitamin led to the conclusion that a certain amount of the vitamin found its way to the spinal fluid following injection. Intralumbar injection of the vitamin resulted in little diffusion into the upper spinal canal, and the vitamin was rather quickly absorbed into the blood stream out of the subarachnoid space. It is considered, therefore, that in practice intralumbar injection of vitamin B₁ would possess no advantage in the treatment of diseases of the central nervous system.

Absorption of vitamin B₁ from the placenta [trans. title], W. NEUWEILER (*Ztschr. Vitaminforsch.*, 10 (1940), No. 1-2, pp. 40-45; *Fr., Eng. abs.*, pp. 44, 45).—A number of women, some of whom received single intravenous injections of 50 mg. of vitamin B₁ at periods varying from 10 min. to 2 days previous to parturition, served as subjects for this study, in which the vitamin B₁ content of the mother's blood, the umbilical blood, and the placenta were determined. In all cases the peak of the blood concentration curve was reached in 5 or 10 min. after the injection, the vitamin B₁ disappearing rapidly thereafter from the circulating blood. It is apparent from the data recorded that the venous umbilical blood is higher than the arterial blood in vitamin B₁ content; this points to an absorption of the vitamin from the placenta. Prior to injection, the content of the mother's blood varied (in eight cases) between 2γ and 12γ percent, with a somewhat parallel variation in the venous umbilical blood. Placental values in cases where the mother received no vitamin B₁ injections varied from 2.7γ to 10.0γ percent; but in the other cases receiving the 50 mg. of the vitamin, the placental values varied from 7γ percent (where injection preceded parturition by 48 hr.) to 500γ percent in one instance in which there was only a 10-min. interval between injection and parturition. On the basis of these results "the placenta is credited with a mechanism for controlling the amount of vitamin B₁ so that the fetus can on the one hand be guaranteed a sufficiency and be protected on the other hand from any excessive saturation with the vitamin."

Pantothenic acid in human nutrition, T. D. SPIES, S. R. STANBERRY, R. J. WILLIAMS, T. H. JUKES, and S. H. BABCOCK. (*Calif. Expt. Sta. et al.*). (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 7, pp. 523-524).—The intravenous injection in 15 subjects of 100 mg. of either sodium or calcium pantothenate was followed by no reaction and no significant changes in the blood pressure, pulse, temperature, and respiration. Analyses of the blood and urine for pantothenic acid before and at intervals after the injection showed that the pantothenic acid content of the blood increased within 3 hr. after the injection to 50 percent above the preinjection level and then returned to the previous level within 24 hr. Urine specimens likewise showed a prompt increase in pantothenic acid, followed by a decrease to the original level within 24 hr. Blood levels of pantothenic acid in 28 patients with pellagra, beriberi, and riboflavin deficiency were from 23 to 50 percent lower than the values obtained with 18 normal controls. Analyses

of the same samples for riboflavin by the method of Snell et al. (E. S. R., 82, p. 587) showed a rise of from 20 to 30 percent in the riboflavin content of the blood following the pantothenic acid injection. The administration of 20 mg. of calcium pantothenate daily for 4 days to 4 persons with symptoms of riboflavin deficiency resulted in temporary increases in both blood pantothenic acid and riboflavin. The injection of 200 μ g. of riboflavin per kilogram of body weight in normal subjects caused an increase of 45 percent in the blood pantothenic acid and 80 percent in the blood riboflavin. These findings are thought to indicate not only that pantothenic acid is essential in human nutrition, but also that its function is probably associated with that of riboflavin.

Pantothenic acid and nutritional achromotrichia in rats, P. GYÖRGEY and C. EL. POLING (*Science*, 92 (1940), No. 2383, pp. 202, 203).—Synthetic pantothenic acid was used in graded doses in the treatment of 30 rats showing different manifestations of pantothenic acid deficiency, including 6 piebald or black rats with localized and 6 with more extensive generalized achromotrichia. In these the therapeutic effect on the depigmentation of the fur was said to be prompt and effective. Doses of from 75 to 100 μ g. daily led to the first evidence (bluish discoloration of the skin) of normally pigmented hair shafts in the epidermis in from 5 to 7 days, with the appearance of black fur and practically complete cure in from 5 to 7 weeks. On lower doses the response was slower and the cure incomplete within the same time limits, but the effect was still pronounced. The authors conclude that "pantothenic acid has a definitely curative effect on nutritional achromotrichia in rats fed a diet free from pantothenic acid."

Ascorbic acid content of pigmented fruits, vegetables, and their juices, M. M. KIRK and D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Canner*, 91 (1940), No. 15, p. 16).—This brief note points to some of the results obtained in the application of the method developed by the authors (E. S. R., 82, p. 730) for the determination of ascorbic acid in plant extracts.

The ascorbic acid (vitamin C) content of juice of the principal varieties of Florida oranges, P. L. HARDING and J. R. WINSTON. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 52 (1939), pp. 90-95, fig. 1).—A brief summary of findings published in full in an earlier report (E. S. R., 83, p. 137).

Vitamin C in packaged foods purchased in retail markets, K. R. NEWMAN and C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 7, pp. 695-696).—Twenty-one canned fruits and vegetables sampled at random in public markets were analyzed for ascorbic acid content and for the presence of gaseous oxygen. Of the 118 individual samples examined, 52 were glass-packed and 66 were in tin cans, but the averages and the range reported for the several products indicated no significant differences due to type of container. The two sets of values overlapped in some cases and differed but slightly in others; 12 products in tin containers contained slightly more vitamin C than those in glass, while 9 products packed in glass were somewhat higher in vitamin C than those packed in tin. Uncombined oxygen was absent from most of the products offered for sale.

Vitamin C retention as a criterion of quality and nutritive value in vegetables, F. FENTON. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 6, pp. 524-535).—On the thesis that vitamin C, of all the dietary nutrients, is probably the most readily lost through solution or through oxidative or enzymic destruction, it is argued that methods of preparation or preservation that tend to conserve this vitamin in foods also permit the greatest retention of other nutrients. Findings, as reported in the literature on losses of vitamin C in vegetables, are reviewed from the standpoint of storage losses; variability of vitamin C content in different parts of the vegetable; losses in preparation and in cooking, canning, and freezing (and subsequent cooking);

and in the rewarming and holding of vegetables once cooked. Assembled data on changes in vitamin C content of vegetables during cooking are tabulated. Forty-six references are given.

Effect of renal retention of vitamin C on saturation tests: A formula for compensation of this factor of error, J. B. LUDDEN and I. WRIGHT (*Arch. Int. Med.*, 65 (1940), No. 1, pp. 151-162, figs. 6).—In subjects with and without evidence of renal insufficiency, the vitamin C content of the urine and blood plasma was determined at frequent intervals during a 24-hr. period following the intravenous administration of 1-gm. test doses of ascorbic acid.

In normal saturated subjects the vitamin C level of the plasma reached a high peak about 2 min. after the injection, fell rapidly during the first 1½ hr. and then more gradually to slightly above the control level at the end of 24 hr.; the urinary excretion reached a peak during the first 15 min., remained relatively high during the first 1½ hr., and then fell rapidly until the fifth hour, at which time 75 percent or more of the total 24-hr. output had been excreted. In subjects with impaired excretion of vitamin C and normal saturation, the excretion of the vitamin was retarded as compared with the plasma levels, and for both urine and plasma there was a delay in the return to control levels. In subjects with impaired excretion and in a state of unsaturation, the vitamin C content of the plasma dropped normally but the urine showed delayed excretion.

These findings showed that in cases of impaired excretion gross errors would have resulted if the 3- or 5-hr. output had been used as an index of vitamin C saturation. However, a comparison of the excretion data for the different periods showed a definite correlation between the percentage of the 5-hr. output excreted during the first 1½ hr. and the percentage of the 24-hr. output excreted during the first 5 hr. From this correlation there was developed a formula

$$C = \frac{ab}{1.26a - 0.27b}$$

in which C represents the excretion of vitamin C in milligrams in 24 hr., a the amount excreted in 1½ hr., and b the excretion in 5 hr. The term saturation index is given to this predicted 24-hr. excretion. From the data obtained in the present study, the mean error in this estimation was 3.12 ± 2.3 percent and the maximum error 13 percent.

The authors are of the opinion that the proposed test gives "a more reliable estimation of the actual state of vitamin C saturation than any other method available at this time."

Variations in the concentration of ascorbic acid in the plasma of the newborn infant, R. L. MINDLIN (*Jour. Ped.*, 16 (1940), No. 3, pp. 275-284, figs. 8).—This paper presents further evidence (E. S. R., 80, p. 857) that plasma ascorbic acid concentration of the infant responds rapidly to changes in dietary supply. The full-term normal infants included in this study were given routine ward care; some received artificial feedings, while others were breast fed, the mothers receiving the house diet with daily ascorbic acid supplements in some cases.

Plasma ascorbic acid determinations in 30 newborn infants and in the mothers within 24 hr. after birth showed considerably higher concentrations in the infants' plasma than in that of the mothers, the averages being 1.16 and 0.42 mg. percent, respectively; in no case was the concentration in the infant's plasma as low as in the mother's. The high concentration of ascorbic acid in the infant's plasma at birth was not maintained, however, the birth average of 1.22 mg. percent in 15 infants falling in 5 cases to an average of 0.74 mg. percent within 48 hr. and to an average of 0.67 mg. percent in the

other 10 cases within 72 hr. This marked fall is not a reliable index as to the degree of asymptomatic scurvy which may be present, since a prompt rise in plasma ascorbic acid concentration was observed in these cases upon resumption of only a moderate amount of dietary ascorbic acid. Following this preliminary decrease, the subsequent course of ascorbic acid content of the plasma appeared to depend upon the changes in the ascorbic acid content of the diet of the infants.

A survey of the state of nutrition with respect to vitamin C in a southern pediatric clinic, A. S. MINOT, K. DODD, M. KELLER, and H. FRANK (*Jour. Ped.*, 16 (1940), No. 6, pp. 717-728).—In this survey ascorbic acid determinations were made on blood samples taken 3-4 hr. after the morning meal. Values of at least 0.7 mg. per 100 cc. were considered to indicate a reasonably satisfactory state of nutrition, between 0.3 and 0.7 mg. a moderate degree of deficiency, and lower than 0.3 mg. per 100 cc. a serious deficiency of vitamin C. Of the 533 children (from under 3 to 15 yr. of age) for whom reliable data were obtained there were 380 with no serious complaint or disease, 105 sick without diarrhea, and 48 with diarrhea as their chief complaint.

During the months in which fresh fruits and vegetables were scarce, about 60 percent of the children in all age groups had ascorbic acid levels below 0.7 mg. per 100 cc., and from 30 to 40 percent of the entire group had levels below 0.3 mg. During the period in which fruits and vegetables were plentiful and cheap, a large percentage of the older children reached a satisfactory level of vitamin C and only about 10 percent of the group gave values below 0.3 mg. The seasonal variation for the group under 3 yr. of age was very slight. More intensive studies, including dietary records, made on 25 children of the normal group during the two seasons showed a close correlation between the levels of ascorbic acid and dietary intake regardless of the season of the year.

Many more of the sick than of the normal children had very low vitamin C levels. In the group without diarrhea 87.8 percent of the children under 3 yr. and 65.6 percent of the older children had levels under 0.7 mg., with 62.5 percent of the younger group and 31.2 percent of the older having values below 0.3 mg. per 100 cc. All of the children with a previous poor dietary history had low values, and some had low values in spite of a liberal intake of vitamin C. From the small number of cases no evidence could be obtained of a higher degree of deficiency in some diseases than others. All but 4 of the 48 children with diarrhea were under 3 yr. of age. Compared with the other sick children of the same age group, the percentage with values under 0.3 mg. per 100 cc. was essentially the same. Large oral doses of ascorbic acid, from 10 to 20 mg. per kilogram given daily for a period of 1 week or longer, usually sufficed to restore the blood serum level of ascorbic acid to values well above 1 mg. per 100 cc. in normal children, but were inadequate for sick children with severe diarrhea.

In spite of the low levels found, there were no clinical evidences of scurvy in the children examined. However, many of the children showed lack of energy, poor appetite, mental apathy, and generally retarded development. "The suggestion is made that diets which are simultaneously deficient in calories and several essential food factors may suppress the typical manifestations of deficiency, despite low levels of ascorbic acid which in otherwise adequately nourished persons would cause outspoken scurvy."

Further evidence of the mode of action of vitamin D, M. C. SMITH and H. SPECTOR. (*Ariz. Expt. Sta.*). (*Jour. Nutr.*, 20 (1940), No. 3, pp. 197-202).—In continuance of studies reported earlier (*E. S. R.*, 84, p. 846), the effect of ingested mineral oil upon the prevention or cure of rachitic lesions by

ultraviolet irradiation was observed in rats on the Steenbock rickets-producing ration No. 2965. In the curative tests young rats were brought to a rachitic condition after 21 days on the diet, whereupon they were divided into two groups, the one continuing on the rachitogenic ration alone, the other receiving this ration incorporated with 10 percent of mineral oil. Paired rats from each group were exposed at the same time to daily ultraviolet irradiation from a mercury-vapor quartz lamp for 5 days, the irradiation periods varying for different pairs from 0 to 240 sec. On the sixth day the animals were killed, and the degree of healing was judged by the "line test" technic. In the preventive tests the animals were placed on the respective diets immediately, and the daily irradiation of both groups was begun at once and continued for 18 days. Irradiation periods for the different pairs varied from 0 to 15 sec.

The tabulated results of both procedures indicate that the mineral oil ingestion interfered with the action of vitamin D formed by external irradiation of the rat body. Whereas a daily irradiation of 45 sec. was sufficient to induce a 2+ healing in rachitic non-oil-fed rats, no healing occurred in the oil-fed group until exposures were of 120 seconds' duration, and a 2+ healing was attained only when the exposure was extended to 180 sec. In the preventive tests the development of rachitic lesions was entirely prevented by a 4-sec. daily irradiation of the non-oil group, while the same length of exposure resulted in severe rickets in the oil-fed rats; for these latter daily exposures of 15 sec. were required for normal bone formation. The results are interpreted as indicating that the vitamin D formed by irradiation reaches the intestinal canal, where the presence of the mineral oil interferes with the role of the vitamin in increasing the absorption of calcium or phosphorus or both.

Prevention of rickets in premature infants with parenteral administration of single massive doses of vitamin D. C. ZELSON (*Jour. Ped.*, 17 (1940), No. 1, pp. 73-78, fig. 1).—In continuation of the studies previously presented by Vollmer (*Il. S. R.*, 84, p. 567), a single dose of 600,000 units of crystalline vitamin D₂ or D₃ in 0.7 cc. of peanut oil and 0.3 cc. of ether was administered parenterally to 20 premature infants, while to 26 others was given by mouth a single dose of from 200,000 to 500,000 units of another preparation. In 17 of these premature infants who could be followed up to an age of from 44 to 279 days, no rickets appeared in those who received 600,000 units of vitamin D₂ or D₃ parenterally. One infant who received 500,000 units of a vitamin D preparation administered orally on the twenty-first day of life showed rickets at the beginning of the fourth month. A second oral dose of 600,000 units of vitamin D₂ cured and prevented rickets up to the two hundred and sixty-second day of life. For general prevention of rickets by parenteral vitamin D shock prophylaxis, two doses, one in October and one in January, are advocated for both the first and the second year of life, with but a single dose in December in the third winter.

Treatment of rickets with minimal viosterol dosage. A. DEG. SMITH and N. A. OWENS (*Jour. Ped.*, 16 (1940), No. 1, pp. 76-78).—The course of healing of rickets was followed by blood calcium and phosphorus determinations and by X-ray films of the wrists in 13 Negro infants, between the ages of 8 and 28 mo., with moderate and severe rickets. The infants were hospitalized under controlled conditions for 56 days. After a 2-week period of observation, each child received for the remaining 42 days daily doses of 800 U. S. P. units of viosterol. No spontaneous healing was observed in the preliminary observation period, but healing was observed in all but 4 cases in the first week of therapy, and 8 of the 13 were almost completely healed at the end of the sixth week.

It is considered from these observations that 800 U. S. P. units of viosterol is an adequate minimum curative dosage for moderate and severe rickets in Negro infants.

On the biological significance of the tocopherols (vitamin E), M. D. WRIGHT and J. C. DRUMMOND (*Biochem. Jour.*, 34 (1940), No. 1, pp. 32, 33).—To test whether α -tocopherol functions in animal tissues as part of an oxidation-reduction system, this vitamin (as the acetate) and its hydroxyquinone (prepared from α -tocopherol by oxidation for a few minutes at 65° C. with 5 percent silver nitrate in 90 percent methyl alcohol) were administered by subcutaneous injection in 5- and also in 10-mg. doses to pregnant rats on a vitamin E-deficient diet. Some litters were successfully cast by rats receiving the α -tocopherol, but all were resorbed by animals receiving the quinone derivative. These results indicate that the quinone is not biologically active in amounts that would be effective were it part of a reversible oxidoreduction mechanism of the tissues.

The fate of tocopherols in the animal body, W. F. J. CUTHBERTSON, R. R. RIDGEWAY, and J. C. DRUMMOND (*Biochem. Jour.*, 34 (1940), No. 1, pp. 34-39, figs. 4).—Two groups of adult rats, one given a vitamin E-deficient diet for 4 mo. after weaning and the other an adequate diet for the same period, were used in metabolism tests. After a preliminary and a control period, animals in both groups were then given wheat-germ oil concentrate in olive oil in oral doses sufficient to furnish 3.5 mg. of α - and β -tocopherols daily. Urine and feces were collected for a week, at the end of which time the animals were killed and the tissues were removed for extraction. Tissues, feces, and urine were extracted with ether, and the residues remaining after evaporation of the ether were taken up in petroleum ether or cyclohexane.

Spectroscopic analysis of the petroleum ether fractions gave no evidence of the presence of tocopherol in the urine, but fats from feces of animals given the supplement contained the vitamin in amounts from 3 to 15 percent of the total amount administered. Presumably this had escaped absorption. The tissue extracts showed no selective absorption related to vitamin E in the case of heart, kidney, adrenals, testes, ovaries, liver, or pituitary, but extracts of leg muscles and body fat showed definite evidence of the presence of tocopherols. In another experiment 10 rats that had been receiving for 12 mo. a diet exceptionally rich in natural tocopherols were continued on this diet over a 3-week metabolism period, and extracts of urine, feces, and tissues were examined spectroscopically. There was again evidence of incomplete absorption, fecal fats accounting for about 25 percent of the tocopherols contained in the basic diet. Urines of these animals also contained a small amount of tocopherol. Examination of the tissue extracts revealed storage of vitamin E in the body fat (about 0.04 percent) and the presence of traces in the blood. Other tissues, including liver, gave negative results. Apparently, therefore, the tocopherol molecule is readily broken down in the body of the rat, and storage occurs in the adipose tissues only when the diet provides an unusually high intake of vitamin E.

A case of arsenic peripheral neuritis treated with synthetic vitamin B₁ and α -tocopherol, R. W. VILTER, C. D. ARING, and T. D. SPIES (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 3, p. 209).—"Partial remission of a severe polynuritic syndrome due to arsenic was induced rapidly with vitamin B₁. A relapse occurred on each of three occasions when thiamin hydrochloride or physiologic solution of sodium chloride was administered and vitamin B₁ discontinued. The most spectacular remissions occurred when vitamin B₁ and α -tocopherol were administered concurrently. To maintain the improvement, these substances had to be administered daily."

Vitamin K-active derivatives of 2-methyl-1,4-naphthohydroquinone. S. ANSBACHER, E. FERNHOLZ, and M. A. DOLLIVER (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 1, pp. 155-158).—Several esters and an ether of 2-methyl-1,4-naphthohydroquinone were prepared by methods described and assayed for vitamin K potency by the chick assay method of Ansbacher (*E. S. R.*, 83, p. 12). The diacetate, dipropionate, and dibenzoate esters showed identical potency (1 unit per gamma), speed of action, and period of efficacy, this suggesting that the esters are first saponified in the body and then act in the form of methyl-naphthohydroquinone. The much greater potencies (1 unit per 1.25γ) of the di-*n*-butyrate and di-*n*-valerate as compared with those (1 unit per 5γ) of the corresponding isocompounds with their branched chains suggest, on the other hand, that these compounds act as a whole and not as methyl-naphthohydroquinone following hydrolysis. Furthermore, the dimethyl ether showed decided potency (1 unit per 5γ), although this compound is probably not hydrolyzed in vivo considering the difficulty with which methyl ethers of phenols are split in vitro. Anthraquinone, also assayed, appeared to have a potency of 1 unit in about 2 mg.

The vitamin K activity of naphthoquinones, E. FERNHOLZ, S. ANSBACHER, and H. B. MACPHILLAMY (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 2, pp. 430-432).—The preparation of a number of naphthoquinones is described, and their vitamin K activity is noted. Under the assay conditions employed, 2-methyl-1,4-naphthoquinone, previously suggested as a basic standard for the assay of vitamin K (*E. S. R.*, 83, p. 857), evidenced a potency of 2,000 units per milligram. This value was not surpassed or even approached by any of the other compounds, and 2-methyl-8-phytyl-1,4-naphthoquinone (vitamin K₁) showed an activity of only 70 units per milligram.

Effect on intra-partum and neonatal administration of synthetic vitamin K analogues on the newborn. A. I. S. MACPHERSON, E. MCCALLUM, and W. F. T. HAULTAIN (*Brit. Med. Jour.*, No. 4142, (1940), pp. 839-844, figs. 6).—Estimations of the prothrombin index employing freshly drawn fontanel blood were made in 54 infants during the first week of life. In 15 cases simultaneous specimens were taken of maternal and cord blood. In general the prothrombin index of the cord blood varied with that of the mothers' blood averaging, however, 15-20 percent less. In 2 cases involving toxemia and eclampsia the cord blood was low in prothrombin (index 49 percent). In the 54 apparently normal infants extreme variations in the prothrombin index were noted, both between different individuals on the same day and in the same case on different days. In general, however, the prothrombin index at birth was about 60 percent, tending to fall, in some cases to dangerously low levels, within the first 3 days of life, and thereafter to rise spontaneously to 70-80 percent, where it was maintained for some months. "Estimations done in babies born after abnormal labor or of mothers suffering from severe toxemia suggest that the type of delivery and the antenatal condition are factors which influence the prothrombin level in the newborn."

Neonatal administration of 2-methyl-1,4-naphthoquinone (5 mg. in 1 cc. of alcoholized oil, orally or intramuscularly) or diacetyl-2-methyl-1,4-naphthohydroquinone (10 mg. in peanut oil orally) raised the prothrombin index to 80-90 percent and stabilized it at that level during the first few days of life. These same compounds administered antenatally to mothers produced the same effect on the prothrombin index during the first week of life as was produced by direct administration to the babies during the first 24 hr. after birth.

Prothrombin studies, especially in the newborn. W. E. BRAY and O. R. KELLEY (*Amer. Jour. Clin. Pathol.*, 10 (1940), No. 2, pp. 154-167, figs. 2).—This study reports the findings on 23 infants who served as the control group in a comparison with a treated group receiving vitamin K. Prothrombin times were

determined daily during the first week after birth, the method of Quick being followed except for the method of collecting the blood in some instances and except for titration of the thromboplastin for the optimum dilution.

The prothrombin time of the newborn was found to be exceedingly variable. It tended normally to be within the normal adult range (15-40 sec.) on the first day, to rise to a peak, definitely higher than the normal adult range between the second and fifth days (usually the third day), and to fall again within the adult range after the fifth day, becoming stabilized. The prothrombin time was very high in 2 cases of hemorrhagic disease of the newborn (maxima of 425 and 555 sec.) and in 2 other cases it was high without tendency to bleed. No bleeding tendency was observed in any cases with low prothrombin time. The results of 49 platelet counts in 14 cases recorded with prothrombin time determined on blood taken at approximately the same time showed no suggestive correlation.

The prothrombin time of cord blood determined in 17 cases tended to be lower than that of blood taken within 24 hr. after birth. It was usually in the normal range for blood from adults. Prothrombin times determined on the same blood, using plasma from the vein, plasma from the heel puncture, and whole blood were in close agreement when the prothrombin time was within the normal range. When the time was prolonged the differences were not clinically significant.

Probable mechanism of the "physiologic" hypoprothrombinemia of the newborn, L. M. TOCANTINS (*Amer. Jour. Diseases Children*, 59 (1940), No. 5, pp. 1054-1056).—A case report is presented of an infant who developed severe jaundice on the second day of life, showing a very high icterus index, a very low plasma prothrombin content, and a tendency to prolonged bleeding of skin punctures. On the eleventh day the condition cleared up, the bilirubin content of the serum dropping to 2.6 mg. per 100 cc., the plasma prothrombin increasing to 113 percent of normal, and the manifestations of bleeding ceasing. The infant still continued to regurgitate all food, due, as became apparent at autopsy on the seventeenth day, to a septum completely separating the first from the middle portion of the duodenum. A patent, functioning bile duct opening distally to the septum and bile-stained debris in the collapsed small and large intestine were found.

The return of the plasma prothrombin level to normal and the cessation of the hemorrhagic tendency coincided in time with the diminution in the bilirubinemia and the establishment of adequate bile flow; at the same time the intestinal obstructive factors continued to operate, preventing the ingestion, digestion, and absorption of any substances essential for prothrombin formation or vitamin K synthesis. The evidence is interpreted as indicating that the liver plays an important role in prothrombin formation, and that the functional and structural immaturity of the liver of the newborn child probably accounts for the appearance of the prothrombin deficiency.

Vitamin K for the pediatrician, with special reference to physiologic hypoprothrombinemia of newborn infants, A. M. GROSSMAN (*Jour. Ped.*, 16 (1940), No. 2, pp. 239-253, fig. 1).—This critical review presents a brief history of the discovery of the vitamin, indicates the sources and mode of action and method of administration, considers the relation to prothrombin blood levels, and describes the technic of the prothrombin determination. Diseases characterized by hemorrhage are cited, with the notation that hemorrhagic disease of the newborn, intracranial hemorrhage, icterus gravis neonatorum, anemia neonatorum, and hydrops congenitus will respond to vitamin K therapy. It is considered that any disease characterized by an interference with the output of bile or destruction of intestinal mucosa (as sprue, chronic ulcerative colitis, and certain other diseases in older children) deserves treatment with vitamin K. It is also suggested that hemorrhagic disease in the newborn infant and its

associated bleeding tendencies be classified as a vitamin-deficiency disease due to a lack of vitamin K. Forty-six references are given.

Vitamin K in prenatal prevention and postnatal treatment of haemorrhagic disease of the newborn. I. N. KUGELMASS (*Arch. Disease Childhood*, 15 (1940), No. 82, pp. 97-102).—A report is given of two mild cases of hemorrhagic disease of the newborn in which the condition was cleared within 24 hr. by the oral administration of vitamin K in oil. Following the vitamin K therapy there was a rise in blood prothrombin, a corresponding diminution in clotting time, and cessation of the spontaneous bleeding. It is pointed out that the success of this treatment in mild cases is no index of its efficacy in cases involving coexistence of hematogenous jaundice, which diminishes absorption of the vitamin, or hemorrhagic disease characterized by injury to the reticuloendothelial system concerned with the formation of prothrombin, or a damaged vascular system.

The experimental production of cirrhosis of the liver by means of a deficient diet. A. R. RICH and J. D. HAMILTON (*Bul. Johns Hopkins Hosp.*, 66 (1940), No. 3, pp. 185-198, figs. 6).—This study reports the occurrence of cirrhosis of the liver, of a type resembling Laennec's cirrhosis in man, in all of 14 rabbits kept from 25 to 113 days on experimental diets supplemented with the various vitamins (A, D, E, B₁, B₂, and nicotinic acid) but lacking yeast. Ascites occurred in 7 of the animals, and microscopic-formed gallstones developed in the intrahepatic bile ducts in 2 animals. When yeast was supplied in these diets, cirrhosis of the liver did not develop in any of the 9 animals observed.

TEXTILES AND CLOTHING

A guide to textiles. M. EVANS and E. B. MCGOWAN (*New York: John Wiley & Sons; London: Chapman & Hall*, 1939, pp. [5]+233, figs. 29).—This book, primarily intended for the college student but of interest and value to the consumer, presents a compilation of basic facts concerning the textiles which are in common use in the household and in clothing. The characteristics of various fibers and general information (rather than technical details) as to textile manufacture and finish, particularly as these are concerned with the uses and the care of the various textiles, are discussed. The material is presented by topical or dictionarylike arrangement with liberal use of cross references. In addition to the major section on textiles, there is a section devoted to furs and leathers. The bibliography lists 30 books and 18 trade papers and periodicals.

Textile fiber atlas, VIII, IX. W. VON BERGEN and W. KRAUSS (*Rayon Textile Mo.*, 21 (1940), Nos. 10, pp. 49-52, 53, pls. 2; 11, pp. 55-58, pls. 2).—In continuance of this series (*E. S. R.*, 84, p. 570) descriptions and photomicrographs are presented for additional fibers.

VIII. Rayon.—Rayon, defined as filaments made from various solutions of modified cellulose by pressing or drawing the cellulose solution through an orifice and solidifying it into the form of a filament, is discussed with respect to the four varieties; namely, viscose, acetate, cuprammonium, and nitro rayon, and with respect to the two forms in which it is marketed; namely, continuous filament yarn and staple fibers of spinnable length. The nature of the manufacturing processes, microscopic structure, determination of denier size, and width measurements are considered.

IX. Protein and synthetic fibers.—Filaments or staple fibers made from various solutions of modified proteins by pressing or drawing the protein solution through orifices and solidifying it into the form of a filament are considered with particular reference to the casein fibers, Lanital (Italy) and Aralac (U. S.), soybean fiber, and regenerated silk. The new synthetic fibers, Nylon and Vinyon,

are also considered. Microscopic appearance is described and cross-section measurements are tabulated.

A rapid method for projecting and measuring cross sections of wool fibers, J. O. GRANDSTAFF and W. L. HODDE (*U. S. Dept. Agr. Cir. 590 (1940), pp. 11, figs. 5*).—A simple and inexpensive method of adapting a microprojector or ordinary microscope for projecting cross sections of wool fibers on a horizontal ground-glass screen is described and illustrated. The mechanical stage and fine-focusing adjustment are operated by remote controls. The fibers are measured from a convenient sitting position with the arms supported by the cabinet top. With the improved bidiameter scale, as many as 4,000 fibers can be sectioned and measured daily by an experienced operator and a recorder. Methods of recording and evaluating the measurements are outlined. The projection apparatus may be used also for examination and measurement of other textile fibers, fur fibers, hair, and bristles.

A study of factors affecting the service qualities of certain textile fabrics (*Kansas Sta. Bien. Rpt. 1939-40, pp. 129-130*).—Included in this progress report (*E. S. R., 80, p. 860*) is a summary of a study by H. Fletcher of the effect of heat and light under uniform conditions on viscose, cuprammonium, and cellulose acetate rayon fabrics.

An instrument for measuring the draping properties of fabrics (*Rayon Textile Mo., 21 (1940), No. 11, p. 31, figs. 3*).—This instrument, known as the drapeometer, consists essentially of a circular support for the upper edge of a sample of fabric 10 in. long and of a width equaling the semicircumference of the circular support. The sample, attached to the supporting disk by means of transparent adhesive tape, hangs freely and "drapes" into its natural form. The contour which the fabric takes at any interval from top to bottom edges depends upon the relative pliability or stiffness of the fabric. The instrument is provided with a pantograph motion which allows the tracing on a record sheet of the curves representing the contours of the fabric at desired intervals. The diagram indicates at a glance whether the fabric is stiff or pliable, and by making certain simple measurements on the graphs the percentage stiffness may be stated on an arbitrary scale. It is pointed out that in this instrument the force acting on the fabric is that of gravity. Since the magnitude of the force depends, therefore, on the actual weight per unit area of the fabric below the contour line selected, it is possible to correct from one fabric weight to another and to determine what the deforming force actually is. The drapeometer, developed at the textile laboratory of the Massachusetts Institute of Technology, has been subjected to an initial series of tests on a wide range of fabrics.

Construction, care of clothing big job of farm homemaker, A. BOWIE (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 11, p. 7*).—It is pointed out that a sewing machine must be considered a good investment for farm homemakers with moderate income, that proper cleaning and moth prevention should be included in upkeep, and that adequate room for hanging and putting away clothes makes the rural woman's task lighter. A tabulation is given which indicates the type of clothing storage facilities available in 101 selected farm families in Mississippi.

ASA clothing committee to vote on body sizes for junior boys (*Indus. Standardization, 11 (1940), No. 10, pp. 257, 258, fig. 1*).—The body measurements under consideration as an American standard are based on the findings reported by O'Brien and Girshick (*E. S. R., 82, p. 430*) for 147,000 boys from approximately 5 to 12 yr. of age. "Work on the actual dimensions and marking of clothing based on the system of body sizes now being studied has not as yet been started, the first step being to arrive at agreement as to the body sizes for which the clothing is to be designed."

HOME MANAGEMENT AND EQUIPMENT

Adjusting farm family living to the impact of war abroad and home defense (*U. S. Dept. Agr., Misc. Pub. 419 (1940), pp. 8*).—This outlook as to farm income in various sections points briefly to general adjustments that would help stretch farm income to cover expenditures for farm family living under the probable price trends for food, housing, and clothing commodities.

Housing of 299 Vermont village families, V. BRITTON (*Vermont Sta. Bul. 469 (1940), pp. 52, figs. 4*).—This report continues the series of analyses of the Vermont data from the consumer purchases study (*E. S. R., 82, p. 716*).

"In general, cash income was by far the most important factor in determining the type of living quarters, housing facilities, household equipment, home tenure, and housing, household operation, equipment, and total home expenses. The number of members in the family was also influential in determining the different elements of housing, while age and education, holding other factors constant, were of little weight. Although the tabulations as a whole showed some relation between housing and family type, between housing and occupation, and between housing and home tenure, these relations may have been due to differences in the cash incomes of the various family types or occupational or tenure groups."

Closets and storage spaces, E. EDWARDS (*U. S. Dept. Agr., Farmers' Bul. 1865 (1940), pp. [2]+22, figs. 17*).—The subject matter in this publication was furnished by M. Wilson of the Oregon Experiment Station (*E. S. R., 80, p. 431; 81, p. 318*) and J. R. Dodge of the U. S. D. A. Bureau of Agricultural Chemistry and Engineering. Working diagrams and plans are given for the construction of clothes closets and fittings; linen closets; bathroom, kitchen, dining-room, and living-room storage; food storage rooms; cleaning and sewing closets; the farm business center; and out-of-door storage.

MISCELLANEOUS

Science—servant of agriculture: [Biennial Report of California Station, 1939–40], C. B. HUTCHISON, S. B. FREEBORN, and H. SCHACHT (*California Sta. [Bien.] Rpt. 1939–40, pp. IX+244, pls. 12*).[†]

Annual report of the director [of Delaware Station], 1940, G. L. SCHUSTER (*Delaware Sta. Bul. 227 (1940), pp. 41, figs. 4*).[†]

[Biennial Report of Kansas Station, 1939–40], L. E. CALL ET AL. (*Kansas Sta. Bien. Rpt. 1939–40, pp. 159, fig. 2*).[†]

Report of the Michigan Agricultural Experiment Station for the two years ended June 30, 1940, V. R. GARDNER (*Michigan Sta. [Bien.] Rpt. 1939–40, pp. 51*).[†]

Fifty-third Annual Report of the South Carolina Experiment Station, [1940], H. P. COOPER ET AL. (*South Carolina Sta. Rpt. 1940, pp. 193, figs. 41*).[†]

Fiftieth Annual Report of [Wyoming Station, 1940], J. A. HILL (*Wyoming Sta. Rpt. 1940, pp. 55*).[†]

Practical results from the State experiment farms, W. L. QUAYLE (*Wyoming Sta. Bul. 243 (1941), pp. 43, figs. 32*).—A summary of recent work.

Mississippi Farm Research, [November 1940] (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 11, pp. 8, figs. 10*).—In addition to articles noted elsewhere in this issue, this number contains the following: Bird Friends More Effective Than Fire from Insect Control, by C. Lyle (p. 1); Rations To Winter the Beef Herds, by A. E. Cullison (pp. 1, 8); and Treatment of Wounds on Shade Trees, by F. S. Batson (p. 8).

[†] The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Purdue University and Indiana Station.—Dr. H. R. Kraybill, chairman of the department of agricultural chemistry and State chemist, has been granted a year's leave of absence beginning April 1, 1941, to serve as director of the department of scientific research of the American Meat Institute. D. M. Doty, assistant chemist, is acting as head of the department. Jack Schinagl has been appointed bulletin editor for the station. T. E. Hienton, associate in agricultural engineering, was called into active service on March 7 as captain in the Ordnance Service of the Army.

Iowa College.—The greater part of the agricultural engineering building was destroyed by fire on March 31. Although much equipment was lost, most of the records were saved. The legislature has appropriated \$125,000 for the replacement of the building.

Minnesota University and Station.—On July 1 Dr. Walter C. Coffey, dean of the department of agriculture and director of the station, became acting president of the university. Dr. Clyde H. Bailey, vice director of the station, became acting director and dean, and Dr. F. R. Immer, professor of agronomy and geneticist, acting vice director of the station. R. L. Donovan, superintendent of the North Central School and Substation, has resigned, and Donald T. Dailey, assistant in animal husbandry, has been appointed acting superintendent.

Experimental work in agronomy and plant pathology will be greatly facilitated during the present year by the completion of the new agronomy building, which will provide much needed space for laboratories, offices, and classrooms.

Cornell University.—Sarah Gibson Blanding, dean of women and associate professor of political science in the University of Kentucky, has been appointed director of the College of Home Economics vice Dr. Flora Rose, who retired in October 1940.

South Dakota College and Station.—L. L. Davis, associate professor of horticulture and forestry and acting head of the department, and Dr. D. H. Jacobsen, assistant professor and assistant in dairy husbandry, have resigned to engage in commercial work.

Washington College and Station.—Dr. C. L. Bedford has been appointed assistant horticulturist in the station and instructor in horticulture in the college to undertake research and teaching in the field of fruit and vegetable production and processing. With the cooperation of the U. S. D. A. Bureau of Agricultural Economics he is making a survey of processing plants in the Pacific Northwest. Donald L. Peters has been appointed grazing specialist in the station and the Western Washington Station to undertake studies on grazing possibilities on cut-over and burned-over lands in western Washington. Mildred M. Boggs, research specialist in foods, has been granted leave of absence for 1 year for graduate study in Cornell University.

Association of Land-Grant Colleges and Universities.—The fifty-fifth annual convention of this association will meet in Washington, D. C., from November 10 to 12, 1941, with the customary preconvention program from November 7 to 9, inclusive.

EXPERIMENT STATION RECORD

VOL. 85

August 1941

No. 2

THE AGRICULTURAL EXPERIMENT STATIONS IN 1940

During the fiscal year ended June 30, 1940, the agricultural experiment stations established in the 48 States, Alaska, Hawaii, and Puerto Rico under the Hatch Act of 1887 and supplementary legislation carried on work organized under more than 8,500 research projects. Many significant contributions to the improvement of agriculture and rural life resulted from these investigations, and the printed record of these studies embraced more than 43,000 pages in 732 station bulletins and circulars, 2,386 articles in scientific journals, and 486 miscellaneous publications. The direct support for these extensive research programs reached a high-water mark of \$21,216,748.61, of which approximately one-third (\$6,848,750) again came from Federal grants and the remaining two-thirds from State appropriations and supplementary sources. The number of research workers on the station staffs was 4,593, an increase of 139 over the previous year.

These findings are among the many which may be gleaned from the latest of the reports which the Office of Experiment Stations renders to Congress each year. As now fabricated, these reports assemble in convenient form data as to the current progress of the stations, discuss their cooperative relations and coordination with the Federal Department of Agriculture and other research agencies, and devote the greater part of their space to summaries on a subject-matter basis of some of the outstanding achievements which have been obtained from their work. This information is based mainly on their published contributions, but it is also supplemented as source material by special reports from their directors as to significant accomplishments of the year. To the extent of its space limits each report is an authoritative compendium of at least the major results of the station work.

In the current report a special discussion is included on the coordination of agricultural research. During the year the Office of Experiment Stations again acted as a central agency to promote cooperation in the planning and conduct of research between the stations and the Department. As Director of Research, the Chief of the Office performed a similar function with respect to research work within the Department. On the one hand, the coordination of the research of the Department and that of the stations was furthered by assisting the

stations to obtain scientific advice and suggestions as well as active cooperative help from the Department, and on the other by assisting agencies of the Department to develop the most effective cooperation with one or more stations.

In addition to a large amount of such assistance rendered informally, especially in connection with the administration of the Federal grants to the States for research, the Office examined, approved, and recorded nearly 1,400 new or revised formal memoranda of understanding covering cooperative research between bureaus of the Department and the State stations, and involving nearly 1,200 major research undertakings. These undertakings covered practical field problems of nearly every major aspect of farm production and rural life. All of the State stations, all of the research bureaus of the Department, and at least three of the action agencies of the Department whose programs are based upon well-defined needs for adjustments in land use and rural-life practices participated in this broad cooperative program. The cooperative agreements of the stations with Department bureaus varied from 7 to 53 per station.

Typical of the social science research pertinent to land use planning and active during the year was that on farm population and farm population movements, which was gotten actively under way at 14 State stations under the over-all cooperative guidance of the Bureau of Agricultural Economics. Examples of pertinent biological research essential to the program of land use planning concerned cereal crop improvement in 20 States, forage crop improvement in 10 States, and grass breeding and improvement in 11 States, all under the cooperative guidance and leadership of the Bureau of Plant Industry. In 9 States vegetable crop and corn improvement studies were completed and the data were being put to immediate use. Cooperative soil erosion control studies, begun on a limited basis in 1936, were active in 47 States during the year, and the continuous flow of practical results was being made one of the major bases for procedure in land use planning.

The experiment stations also worked more closely with other State agencies, with local organized groups, with each other in regional groups, and with the U. S. Department of Agriculture in efforts to coordinate their research along the most effective lines. Evidence that this effort was fruitful was reflected in the fact that 28 States completed work in the cooperative study of farming adjustments by regions and type-of-farming areas. Some 33 active adjustment studies were being continued in 20 States in order to bring to early completion this foundation material for Nation-wide land use planning.

Another outstanding recent accomplishment was the completion of a study of New England milk marketing, dealing particularly with the Boston milkshed. On completion, this study was immediately fol-

lowed by a regional program of agricultural economics research in New England which involves all the States in the area and the Bureau of Agricultural Economics in an organized effort to establish a pattern of basic principles of agricultural economy.

The agronomic research of the stations dealt with new and better crop varieties, improved cultural methods and field practices, more exact and economical use of fertilizers, and higher qualities of farm products; effective ways to use and conserve meadows, pastures, and ranges; and improved measures for weed control. Examples of advances in crop improvement are the development and expansion of one-variety cotton communities involving use of superior varieties of cotton; the continued phenomenal increase in the growing of hybrid corn—concurrent with the production by the stations of new hybrid combinations; creation of new wheats, combining resistance to plant diseases and to insects, as hessian fly, with good milling and baking qualities; and the development of soybeans and sweetpotatoes suitable for special industrial uses, early and cold-resistant sugarcane which prolong the milling season, and alfalfa strains outstanding in resistance to bacterial wilt and cold and in production of forage and seed. The stations also have developed productive new kinds of oats, barley, rice, flax, potatoes, tobacco, sorghums, clovers, and grasses. Profitable modifications of cropping practices seem certain to result from findings which point to the use of depth of soil moisture at seeding time as a criterion of prospective yields of spring wheat; the wider application of foliar diagnosis to determine needs of crops for plant foods; better formulas and more effective placements of fertilizers for corn, potatoes, truck, and other crops; the use of electricity, as in the economical production of sweetpotato plants in electrically heated hotbeds; and well-planned rotations which take into account crop behavior, as the favorable response of tobacco to weed fallow and sugar beets to preceding crops. Maintenance and improvement of quality of product may be assured by the application of results of studies indicating proper storage conditions for wheat and soybeans; the optimum time for harvesting these crops, corn, and Havana tobacco; conditions for the curing and handling of Burley tobacco to obtain a superior product; and the best stage for cutting alfalfa and meadows in general; and by giving proper attention to the fertilization of potatoes, tobacco, and other crops. Conspicuous examples of pasture research were the profitable use of a grain-lespedeza 1-year rotation for beef pasture, and grazing management of native and tame pastures for greater carrying capacity and increased beef production; development of better pasture plants for definite purposes and particular situations; and the response of pasture to renovation and fertilization. Research on range improve-

ment dealt with changes in range vegetation and the restoration of depleted range and abandoned cropland; grazing management; and improved range plants and ways to establish them. Useful information was gained in weed research, especially on effective eradication measures, control of pasture shrubs as an improvement practice, and the economic utilization of weed plants.

In 1940, the Department, working jointly with the New York (Cornell) Station, confirmed on an orchard scale the rather amazing possibilities suggested by earlier work in reducing preharvest fruit dropping in the apple by the application of dilute solutions of certain growth-promoting substances, such as naphthaleneacetic acid. These materials apparently retarded the normal abscission processes in the fruit spurs and permitted the apples to remain attached to the tree until well colored. The findings had wide significance and were immediately taken up by commercial manufacturers, who are already offering materials to the growers under various trade names. The new spraying technic is of major importance with certain apples, such as McIntosh, which are peculiarly susceptible to preharvest dropping. Other horticultural work dealt with varietal improvement, breeding and genetic studies, cultural methods, handling and storage, and other phases of work with fruits and nuts, vegetables, and ornamentals.

During the past year, progress was reported in working out practical means of soil and water conservation under Great Plains conditions, the action of soil micro-organisms in soil conservation, and the effect of tillage practices on soil conservation. Knowledge of the condition of plant nutrients in the soil, how the nutrients become available, and a possible method of entry of nutrients into the plant has been greatly advanced. The role of soil organic matter in soil conservation, plant nutrition, and soil moisture relationships was investigated further at several of the stations. Developments were made in fertilizer practice through the extension of the use of non-acid-forming fertilizers, the use of fertilizers of higher plant-food content, and including in the fertilizer mixture minor elements found to be essential for healthy plant growth.

According to the report, research agencies concerned with problems in animal production are learning that the pooling of their resources has many advantages. While this procedure is not new, it received a marked stimulus from the establishment of the Bankhead-Jones regional laboratories. Experimental work with farm animals is costly, and in addition the concentration of large numbers of animals presents many difficulties from the standpoint of disease control. By combining facilities, following a procedure agreed to by

all interested parties, it has been possible to use a sufficiently large sample to give weight to the results, but not to burden the individual agency with an unwieldy overhead. These cooperative and coordinated programs are extending to many phases of research with animals and animal products. Among the oldest of these joint undertakings are the cooperative meat investigations. The regional laboratories are serving as focal centers for studies in the improvement of sheep and swine by breeding, the improvement of viability in poultry, improvement of pastures, and methods of combating animal diseases. Other such studies include jack-stock and mule production, input as related to output in dairy farming, relation of conformation and internal anatomy to productive ability in dairy cows, proving dairy sires for ability to transmit increased milk and butterfat production, and cheese-quality improvement. In all of the above work the Department of Agriculture is cooperating with the State stations. Another example of a coordinated research undertaking is found in the field of physiology of reproduction in farm animals. Mutual problems and technic are discussed and plans for further research are made at an annual meeting of workers in this field. A number of State experiment stations are working on different phases of a national problem to find a satisfactory means of feeding high-roughage-low-concentrate rations to dairy cattle.

Research on agricultural engineering has been carried on by the experiment stations for more than a generation, and has become an essential technic in the development of the modern concept of farming as a method of living as well as an industry. The present discussion relates particularly to the development and adaptation of mechanical farm equipment, the use of irrigation water, electrification, and the improvement of farm structures.

The heading of Home Resources for Defense is given the 40-page section dealing with foods and nutrition, textiles, the house and its equipment, family income and consumption patterns, and family relationships. It is pointed out that proper nutrition, which is being emphasized on all sides as the first bulwark of defense for the Nation, depends upon many factors, some of which have been the subject of research at the stations from their establishment more than half a century ago. Notable contributions to present knowledge of the vitamins and their functions have come from their work, largely in connection with research for the improvement of domestic animals. Increased emphasis is now being given to human nutrition in its various aspects. Among the topics for which progress is reported are mineral requirements and utilization, vitamin functions and requirements, food preservation (especially frozen storage) and prepa-

ration, and income and consumption patterns. Because of the wide popular interest in these subjects, separates of this section have been made available.

As regards rural social science, the emphasis being placed upon the technical phases of soil conservation, crop adjustment, and other improvements in land use is reflected in the research in agricultural economics and rural sociology. The concept of planning, broadened to include the economic and sociological as well as the technical phases, calls for the results of previous research in such fields as farm management, marketing, costs, taxation, tenure, and credit and for new types of research concerning, for example, the alternative uses of land, the diet and health of the rural family, and a diversity of short-term, or service, research helpful in planning for better rural conditions. Other phases of economic and social study now demanding attention are population problems including its migration and distribution, rural education, transportation facilities, and the rural family and its consumption requirements in terms of food, clothing and shelter, and a satisfactory home and community life. Progress was reported by one or more stations in most of these directions.

The total number of projects for which specific findings are set forth in the report is about 1,500, so that detailed discussion of individual items in these columns is impracticable. Nearly all, however, embody suggestions for an improved farm practice and rural life and not a few are capable of immediate application and are of much economic significance. Even casual perusal of the report will reveal the potential value of these additions to knowledge and indicate how useful the stations have been during the year under review.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940, pt. 1, pp. 97, 131, 151-154, 233-234*).—This report notes work on fructosan content of some Iowa grasses, by A. G. Norman, C. P. Wilsie, and W. G. Gaessler; nitrogen and accessory growth factor requirements of bacteria, especially the lactic and propionic acid forms, by C. H. Werkman; development of the use of clay for the clarification of sorghum sirup, by Gaessler and J. T. Lonsdale; levulose from chicory, dahlias, and artichokes, by R. M. Hixon and E. S. Haber; and possibilities of power alcohol from farm products, by G. S. Shepherd.

[Investigations at the Iowa Station on the chemistry of corn and its raw-material characteristics]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940, pt. 2, pp. 56-65*).—Work on the following topics is briefly noted: Chemical and physical characteristics of corn as they relate to industrial utilization, by R. M. Hixon, W. G. Gaessler, and (i. F. Sprague; chemical and physical characteristics of sweet corn pericarp as related to toughness, by Hixon, Gaessler, and E. S. Haber; oxidation of cornstarch, identification of the compounds responsible for the odor of yellow corn, absorption spectra of starch-iodine complexes, development of laboratory control technics for cornstarch production, and physical properties of dextrans isolated from corn sirup, all by Hixon; characterization of the products of enzymic starch degradation, by N. M. Naylor; fractionation and characterization of corn protein, by Hixon and Gaessler; X-ray and microscopic studies on starch, by R. S. Bear; protein and vitamin values of various portions of corn, by J. A. Schulz, B. H. Thomas, and Hixon; Raman spectra of sugars, dextrans, and starches, by F. H. Spedding and Hixon; utilization of agricultural products in the fermentative production of lactic acid, by C. H. Werkman; and changes in corn carotenoids during wet milling, by Bear.

Polysaccharides of the vegetative tissues of maize, C. G. BARR. (Iowa Expt. Sta.). (*Plant Physiol.*, 14 (1939), No. 4, pp. 737-753, figs. 11).—The author obtained four polysaccharide fractions from vegetative maize tissues, the first being readily soluble in cold 10 percent alcohol, the second slowly soluble in boiling water, the third being rapidly dissolved by boiling in 1 + 20 hydrochloric acid, and the fourth not being dissolved by this hot, dilute acid. The fractions extractable by water appeared to be dextrans of medium and of high molecular weight. The acid-hydrolyzable fraction was commonly larger than the total of the two water-soluble fractions. A reasonably sharp end point for the hydrolysis was obtained after 3 hr. at 100° C. or 1 hr. at 120° with 1 + 20 hydrochloric acid.

This fraction showed no significant daily or seasonal variations after the plants reached the silking stage, except as the result of variation in the carbohydrate content of the pith tissue associated with loss of water from the pith of maturing stalks. When these data were calculated to a sugar- and dextrin-free dry-weight basis the apparent late season increases disappeared.

Carbohydrate values of fruits and vegetables, R. D. WILLIAMS, L. WICKER, H. R. BIERMAN, and W. H. OLMISTED (*Jour. Nutr.*, 19 (1940), No. 6, pp. 593-604).—A system of analysis, based in part on the work of Williams and Olmsted,¹ is outlined for determining in foods of plant origin the content of glucose, fructose, sucrose, starch, hemicelluloses (including pentosans, hexosans, pectins, and uronic acids), and cellulose. Representative carbohydrate values determined by this method for a total of 20 foods agreed very well with those obtained by McCance et al.² in direct analysis of individual carbohydrate constituents and with those calculated as the sum of total sugar plus starch, as reported by Chatfield et al. (*E. S. R.*, 65, p. 91).

For the purpose of dietary calculations, a new classification of fruits and vegetables according to their carbohydrate content is presented for a limited number of products. This classification, based on determined values for available carbohydrates, is more accurate than the classification of Adams and Chatfield (*E. S. R.*, 74, p. 875) based on values for nitrogen-free extract.

Report on riboflavin, A. R. KEMMERER (*Tex. Expt. Sta.*). *Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 346-351).—This report of the associate referee (*E. S. R.*, 84, p. 582) reviews briefly the various published methods for the determination of riboflavin, and outlines the procedure used for collaborative study. This method involved extraction of the pigment by treatment of the biological substance under test with 40 percent methanol containing 4 percent acetic acid for 24 hr. at 35°-40° C. After filtration, contaminating impurities were oxidized with 4 percent KMnO_4 , the excess permanganate being destroyed with 3 percent H_2O_2 . After dilution to volume with pure methanol, and filtration, the riboflavin in the solution was estimated colorimetrically by comparison with 0.02 percent K_2CrO_4 as a color standard, and the riboflavin concentration (parts per million) was calculated by the formula $(d+4.4)/(d_s \times 1.4)$, where d was the depth of the chromate solution and d_s the depth of the riboflavin solution. In the hands of the collaborators furnished with samples of skim milk powder and yeast, the method gave high and rather inconsistent results even with the same operator. The collaborators were of the general opinion that the methods of extraction and purification were inadequate and that interfering pigments were present. It is recommended that chemical methods for riboflavin be studied further with consideration of fluorometric methods, and that the Snell-Strong bacteriological technic be studied further.

An improved rat growth method for the assay of vitamin B₁, including sulfite treatment of dietary constituents, O. L. KLINE, W. L. HALL, and J. F. MORGAN (*U. S. D. A.*). (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 147-154).—This report discusses the conditions under which sulfite has been found most effective in the preparation of the vitamin B₁-free constituents of a basal diet for determining the B₁ content of any material by a rat-growth method (*E. S. R.*, 81, p. 454), describes the method in full detail, and gives data showing its reliability and sensitivity. The method as described has been adopted by the Association of Official Agricultural Chemists as a tentative Official method.

Isolation of carotene from green plant tissue, H. G. PETERING, P. W. MORGAN, and H. J. MILLER (*Mich. Expt. Sta.*). (*Indus. and Engin. Chem.*, 32 (1940), No. 10, pp. 1407-1412, figs. 6).—Dehydrated alfalfa-leaf meal is extracted with acetone. The extract is refluxed with solid barium hydroxide octahydrate, chlorophyll and saponifiable lipoids being thus moved as a green sludge. The solution is concentrated until a waxy residue containing the carotene separates, leaving flavones and other water-soluble constituents in solution. The waxy residue is

¹ *Jour. Biol. Chem.*, 108 (1935), No. 3, pp. 653-666.

² [*Gt. Brit.*] *Med. Res. Council, Spec. Rpt. Ser. No. 213* (1936), pp. 107, figs. 26.

extracted with cold acetone. Most of the carotene and xanthophyll and some of the lipoidal matter go into solution. The extract is concentrated to an oil, taken up into petroleum solvent, and purified of contaminating xanthophyll and lipoidal matter. Proteins, carbohydrates, cellulose, and other plant materials not extractable are not destroyed in this procedure.

The oxidation of vitamin E, C. GOLUMBIO and H. A. MATTILL (*Jour. Biol. Chem.*, 134 (1940, No. 2, pp. 535-541).—This paper reports the measurement of an apparent oxidation potential of α -tocopherol, such a potential suggesting the existence of an initial reversible step governing the rate of the irreversible oxidation. If the system extended from α -tocopherol to α -tocopherylquinone, the latter as well as the former should have biological activity; however, this latter compound, even in relatively large doses, was found not to possess biological activity as measured by the capacity to cure sterility in female rats reared on a vitamin E-deficient diet. "These observations suggest that the reaction α -tocopherol \rightarrow α -tocopherylquinone is not reversible in the organism. If, as is probable, the reaction takes place in two steps, the first step is reversible and may have biological significance."

New uses for maple sirup, C. J. TRESSLER and W. I. ZIMMERMAN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 1, 8, fig. 1).—Products specifically mentioned are maple cream and maple jelly. It is noted that the cream may be more easily made by stirring in an ice cream freezer than by the usual method of stirring with a wooden paddle. By boiling to 233° or 234° F. instead of to the 222° temperature usually used for sirup a more stable and stiffer cream may be obtained. The jelly made from maple sugar by the addition of pectin, a very small quantity of phosphoric acid, and other substances is also discussed. Jellies of this type could be made to possess excellent jelly characteristics and color and a desirable flavor.

Lettuce kraut and juice, W. V. CUESS and R. GILLILAND. (*Univ. Calif.*). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 18 (1939), No. 8, pp. 231-232, 251).—Lettuce kraut made by trimming, coring, and slicing heads of lettuce and adding 2.5 percent of salt and fermenting in the same manner as employed in making cabbage kraut was found to be of pleasing quality and believed to have commercial possibilities, being mild in flavor, firm in texture, and of good cooking or canning quality. Juice expressed from lettuce kraut, made with 2 percent salt, was light in color, pleasing in flavor, and withstood canning or bottling very well. It was found superior to juices made in these tests in other ways, such as pressing raw or steamed lettuce with or without subsequent acidification or fermentation of juice expressed from raw or steamed lettuce.

Objective methods for determining the maturity of peas, with special reference to the frozen product, F. A. LEE (*New York State Sta. Tech. Bul.* 256 (1941), pp. 17).—The method described depends upon the determination of the specific gravity of the thawed sample by means of difference in the weights (1) in a mixture of xylene and carbon tetrachloride and (2) air. Equipment needed and the method of calculation of the results are described. The determination of alcohol-insoluble solids was modified by processing the thawed peas at 240° F. for 30 min. The peas were then cooled and drained and the determination was made in the usual way. When used for the raw vegetable, the specific gravity method was found to be unreliable, probably because of the presence of air in the tissues, and determining alcohol-insoluble solids in the raw peas gave somewhat better results. It is shown that the tenderometer can be satisfactorily used for determining the grade of blanched and separated peas. The values obtained by means of the texturemeter showed reasonably good correlation with those obtained with the tenderometer. A table of correlation coefficients is included.

Some new uses for fruit: Fruit utilization, past, present, and future, D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 18 (1939), No. 6, pp. 164-166, 180) —Freezing storage, preparation of pulp and clear carbonated fruit juices, use of carbon dioxide atmosphere to prolong the storage life of fruits, and various other processes and products are discussed, with reference especially to developments in New York State.

Cooperative research on fruit juices at Geneva, New York, C. S. PEDERSON, E. A. BEAVENS, and D. K. TRESSLER. (N. Y. State Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 18 (1939), No. 11, pp. 330-331). —The authors discuss briefly the progress made in the improvement of methods for the preparation of high-quality fruit products from the fruits produced in the Northeastern States and point out that a great increase in utilization in various fruit byproducts is possible. "More thought and attention will have to be given toward inhibiting oxidative and enzymic changes and destruction of flavor in the products by faulty pasteurization methods," however.

[Factors affecting the quality of apple juice] (*Maryland Sta. Rpt.* 1940, pp. 55-56). —The effect of flash pasteurization, filtering, and canning on juice from a number of apple varieties is briefly noted.

The preparation of new types of unfermented grape juices by blending, A. T. MYERS and J. S. CALDWELL (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1939), Nos. 1, pp. 5-10; 2, pp. 36-40, 57; 3, pp. 69-72, 80, 89). —Investigations were carried on over a period of 2 yr. on the blending of grape juices as a means of producing new high-quality unfermented beverage juices, 46 different varieties of grapes being used in this work and several hundred combinations of 2, 3, or more juices made.

A physiological study of carotenoid pigments and other constituents in the juice of Florida oranges, E. V. MILLER, J. R. WINSTON, and D. F. FISHER (U. S. Dept. Agr., Tech. Bul. 780 (1941), pp. 31, figs. 12). —Using a new and more accurate method for determining total carotenoid pigments in citrus juices, the authors found that, from September to March, the early and midseason oranges showed a gradual increase in carotenoid pigments. Valencia oranges (late) showed an increase in pigment in the juice up to February or March. This was usually followed by a decline. Seasonal changes in the mandarin type of oranges for the most part were similar to those in the sweet orange type, but the mandarin varieties were much higher in carotenoid pigments than other varieties. Ripening in all varieties was characterized by an increase in soluble solids and in pH values, and a corresponding decrease in total acids and in ascorbic acid. Other conditions being the same, oranges grown on sour orange rootstock contained higher percentages of solids and of acids than those grown on rough lemon stock, but the degree of pigmentation was apparently not affected by rootstock. The percentage of carotenoid pigments in the juice generally varied with the locality in which the fruit was grown, "there being a suggestion that low pigment content was associated with soil of low fertility." Degree of pigmentation in the juice was not an index of stage of maturity nor always of quality. The early and midseason fruits were marketable before attaining maximum percentages of pigments, and Valencias were frequently marketed after decline had set in.

Physical characteristics of Florida orange oil produced during 1937-38 season, H. W. VON LOESECKE and G. N. PULLEY. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 18 (1939), No. 8, pp. 228-230, 249, 251, figs. 3). —Methods for the commercial production of orange oil as now practiced in Florida are outlined. With respect to physical characteristics, no differences among oils prepared commercially from different varieties of Florida fruit were observed, nor any correlation between time of commercial production and the physical

characteristics of the oil. Oils produced from fruit grown in five different countries showed no differences in physical characteristics, "with the possible exception that oil from fruit grown in Hardee County may have a higher total solid content." The method of preparation did have an effect upon the physical characteristics of the oil.

Observations on olives and olive products in Egypt and Italy, W. V. CRESS (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1939), No. 1, pp. 11-16, 25, 27-28, figs. 3).—The author's personal observations of olive culture and pickling in Egypt, and of culture, pressing for oil, and oil refining in the Bari district in Italy are summarized.

Abstract of papers presented at California Frozen Foods Conference (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1939), Nos. 1, pp. 17-19, 24; 2, pp. 50-52, 60).—This compilation of abstracts summarizes the following among other articles: Essential Factors for Securing Raw Materials of High Quality for Frozen Pack, by D. G. Sorber (pp. 17-18) (U. S. D. A.); "Quality in Frozen Foods—What It Is and How It Can Be Measured," by M. A. Joslyn (p. 50) (Univ. Calif.); Tentative U. S. Standards for Grades of Frozen Peas, by E. P. Bostwick (p. 51), and Necessary Precautions in Manufacturing and Distributing High Quality Frozen Fruits and Vegetables, by E. M. Chace (pp. 51-52) (both U. S. D. A.); and General Aspects of Frosted Foods Merchandising and Packing, by J. Besone (pp. 52, 60) (Univ. Calif.).

Moisture vapor proofness of wrapping materials used on frozen foods, C. W. DuBois and D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1939), No. 4, pp. 107-109).—Taking as a tentative basis for the selection of a suitable paper or other wrapping material a series of tests showing that it adequately protects meat and other foods from desiccation at +5° F., that it transmits not more than 3 gm. of moisture vapor per square meter per 24 hr., and that it is not stained by blood or grease and does not become brittle at low temperature, the authors report upon 25 packaging materials and list 13 of these as adapted for the use named.

Effect of calcium on plant tissues, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 18 (1939), No. 6, pp. 176, 187).—The author points out the possibilities of treatment of fruits and fruit products with small quantities of calcium salts in canning, in the preparation of material for preservation by freezing, and in the preparation of such products as preserves, jams, jellies, etc., in which the pectin and pectic acid of the fruit are of importance. In the canning of tomatoes as little as from 0.05 to 0.1 percent of calcium chloride improves firmness. In canning apples and apple products the calcium salt may be added during the usual preliminary treatments. In the preparation of fruits for freezing storage added calcium salts were shown not only to give better preservation of natural structure but also to prevent the browning of such fruits as apples and peaches after thawing. In the manufacture of preserves, jams, and jellies some pectic acid in addition to that naturally present is usually formed by heat and enzyme action, and the addition of small quantities of calcium salt will result in the formation of a calcium pectate gel and will thereby add to the effect of the pectin.

Clostridium pasteurianum associated with spoilage of an acid canned fruit, C. H. SPIEGELBERG. (Hawaii. Pineapple Prod. Expt. Sta.). (*Food Res.*, 5 (1940), No. 2, pp. 115-130, figs. 2).—The author isolated two strains of saccharolytic butyric acid-producing anaerobes from bursting swells of canned pineapple. These strains were found not to be identical with previously described strains of *C. pasteurianum* but to resemble the known strains of that organism so closely that they may be considered strains of the same species. The two new strains produced smooth and rough colonies, respectively.

Action of acetic acid on food spoilage microorganisms, A. S. LEVINE and C. R. FEILERS. (Mass. Expt. Sta.). (*Jour. Bact.*, 39 (1940), No. 5, pp. 499-515, pl. 1).—Acetic acid in nutrient broth inhibited the growth of various microorganisms related to food spoilage. The bacteria used did not grow in broth adjusted with acetic acid to pH 4.9. *Saccharomyces cerevisiae* did not grow at pH 3.9, and *Aspergillus niger* was inhibited at pH 4.1. Because of its lethal activity at comparatively high pH values, the toxicity of acetic acid for various microorganisms is not attributable to the H-ion concentration alone but seems also to be a function of the undissociated acetic acid molecule.

An increase in the H ions lowered the thermal death points of the bacteria studied. The reduction in lethal temperature was more marked in the case of *Bacillus mesentericus* and *B. cereus* than with the non-spore-forming organisms. Thermal death points of the yeast and the mold were unaltered by the addition of small amounts of acetic acid. Comparative studies showed acetic acid to be more toxic than either lactic or hydrochloric acid to *Salmonella aertrycke*, *Saccharomyces cerevisiae*, and *A. niger*. These organisms were inhibited or destroyed at a higher pH value with acetic acid than with lactic or hydrochloric acids. The mold utilized relatively high amounts of lactic acid to develop a growth heavier than that obtained from the acetic acid or the hydrochloric acid series.

The utilization of amino acids and of glucose by *Clostridium botulinum*, C. E. CLETON (*Jour. Bact.*, 39 (1940), No. 5, pp. 485-497, figs. 2).—The amino acids alanine and glycine appeared to be utilized by *C. botulinum*, types A and B, mainly by an oxidation of the alanine to acetic acid, carbon dioxide, and ammonia, together with a reductive deamination of the glycine. Glucose was fermented directly, ethyl alcohol and carbon dioxide being the chief products of its dissimilation.

A comparative study of standard lactose broth and modified Eijkman medium for isolation of *Escherichia coli* from nut meats, M. OSTROLEK and A. C. HUNTER. (U. S. D. A.). (*Food Res.*, 5 (1940), No. 2, pp. 141-145).—The Eijkman medium was found superior to standard lactose broth in limiting the growth of *Aerobacter* and *Citrobacter*, but it also retarded the development of *E. coli*. In equal numbers of inoculated tubes of the two media, the standard lactose broth developed three times as many presumptive tests as did the Eijkman medium. In determining evidence of fecal pollution on pecan meats, standard lactose broth yielded *E. coli* in 28.6 percent more plants, 15.7 percent more samples, and 6 percent more inoculated tubes than did the Eijkman medium. The temperature requirements for the use of the Eijkman medium are considered also to limit its practicability in routine work.

Germicidal properties of paraffin, F. W. TANNER and H. F. LEWIS. (Univ. Ill. et al.). (*Oil & Soap*, 17 (1940), No. 2, pp. 26-30).—Paraffin impregnation of wrapping papers, paper milk bottles, etc., destroyed relatively very heavy inoculations of test organisms (*Escherichia coli*, etc.) almost completely in every case. Bacteria introduced into the paraffin bath by these means did not infect uninoculated containers paraffined alternately in the same bath with the inoculated material.

A study of factors influencing the color contributed to soap by gum rosin, W. D. FOELE and C. F. SPEH. (U. S. D. A.). (*Oil & Soap*, 17 (1940), No. 5, pp. 100-106).—A method for evaluating the darkening a rosin will impart to soap involves the preparation of a rosin soap and measuring its reflectance value to MgO for blue light, wavelength 436 m μ with a photoelectric photometer. The color contributed by rosin was evaluated by the soap darkening index of the rosin ($-\log B$ for the rosin soap less $-\log B$ for the soap stock).

It was found that the primary gum acids in their original states contribute little or no color to rosin soaps, but some of them are so unstable toward heat and oxygen that color-producing acids are always found in rosins made from gum collected and processed in the usual manner. The amount of these color-producing acids present depends upon type of gum and conditions of collection and processing. The acids most unstable to heat and oxygen are associated with the resin acids that crystallize readily from the gum, rather than with those that do not, and the resenes are stable toward heat and exposure and do not aid or hinder any of the changes observed. Abietic and abietic type acids give a characteristic orange color to rosin soap cakes prepared by the method adopted. Soap tests confirm the findings that some of the crystalline type rosin acids are converted to abietic type acids when heated. The darkness index and the color of the rosin soap cake made with normal gum rosin both indicate that normal gum rosin is not 90 percent abietic acid, as has been stated. It was shown that the resinates of iron, aluminum, and zinc are negligible factors in contributing to the color of rosin soap, and that the presence of scrape or oxidized resin and rosin acids increases the color rosin gives to soap.

Use of oxalic acid in the gum during distillation favors the production of acids that give color to soap, and the color of the soap indicates that they are an abietic type acid. Iron-contaminated gum can be treated with oxalic acid without isomerizing the primary acids to forms that give color to soap. Aging tests showed that after the first month the rosin soap cakes changed color slowly. An appreciable darkening of the lighter samples took place, except in the case of the white rosin soap made with pyroabietic acid.

Bactericidal properties of allyl isothiocyanate and related oils, M. J. FOTER. (Univ. Conn.). (*Food Res.*, 5 (1940), No. 2, pp. 147-152).—The author found that allyl isothiocyanate, the main volatile constituent found in crushed horseradish, and the related compounds methyl and ethyl isothiocyanate exhibit bactericidal effects on a variety of organisms when tested by several methods. The organisms employed differ in their resistance to these compounds. The bactericidal efficiency of the oils could be more accurately determined by dilution in agar or by the preparation of aqueous suspensions than by exposure of agar plates to the vapors from similar dilutions. The presence of 5 percent by volume of sterile cow serum slightly interfered with the bactericidal efficiency of the oils. The inhibitory effect on the growth of micro-organisms produced by vapors from horseradish is considered probably due to allyl isothiocyanate.

Smoke, flash, and fire points of soybean and other vegetable oils, S. B. DERWILER, JR., and K. S. MARKLEY. (U. S. D. A. and Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., and Wis. Expt. Stas.). (*Oil & Soap*, 17 (1940), No. 2, pp. 39-40).—The authors call attention to the facts (1) that the reaction time in polymerizing soybean oil for varnish manufacture may be reduced by as much as one-third by raising the temperatures from 307° to 315° C. and (2) that smoke, flash, and fire point data adequate to show whether or not this increase in working temperature is dangerous in the open-kettle process are lacking. They tabulate smoke, flash, and fire points as determined by the Cleveland open-cup method for numerous samples of crude expeller oils, crude solvent-extracted oils, and refined oils, together with like data for a number of oils from sources other than soybeans. The average flash points of three grades of soybean oil were 300°, 316°, and 329°, respectively, and their fire points 351°, 355°, and 361°, respectively. The authors conclude that soybean oil appears to be superior in smoke, flash, and fire point characteristics to all other oils of corresponding type which were examined, and that good quality soybean oil, free from excessive quantities of free fatty acids and foots, may be safely heated to 315° and above without undue risk of fire.

A crystallization method for the determination of saturated fatty acids in soybean oil, F. R. EARLE and R. T. MILNER. (U. S. D. A. and Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., and Wis. Expt. Stas.). (*Oil & Soap*, 17 (1940), No. 5, pp. 106-108).—A sample of about 5 gm. of mixed acids is placed in a test tube and 50 cc. of acetone is added. The tube and its contents are suspended in a cold bath consisting of acetone and dry ice at about -41°C ., and the sample is stirred occasionally with a thermometer until the temperature reaches -40° . The soluble acids are then removed by filtering through a glass filter stick which has been previously cooled to the temperature of the bath. The solid materials clinging to the thermometer and filter stick are washed back into the test tube with 50 cc. of acetone and permitted to dissolve. After two more crystallizations the solid acids are dissolved in acetone and transferred to a small tared flask. The solvent is removed on a steam bath, and the residue is dried in an oven at 105° for 0.5 hr. The flask and contents are cooled and weighed, and the amount of "solid" acids is calculated. The iodine number of the solid acids is determined and used to calculate the amount of unsaturated acid in the solid acid fraction, assuming that the only unsaturated acid present is oleic. Subtraction of the "oleic" acid from the solid acids gives the amount of saturated acids present in the original sample of mixed fatty acids.

The determination of fat in the presence of free fatty acids.—I, The Mojonnier test of mixtures of free fatty acids and butterfat, M. P. STARR and B. L. HERRINGTON. (Cornell Univ. et al.). (*Jour. Dairy Sci.* 24 (1941), No. 2, pp. 165-168).—In an effort to simulate conditions occurring in rancid dairy products, known weights of a mixture of fatty acids approximating completely hydrolyzed butterfat were added to known weights of fresh butterfat. When these mixtures were tested by the Mojonnier method only 24 percent of the mixture of fatty acids was recovered with the fat, this figure being practically constant for the entire range of mixtures. The significance of these findings in relation to the fat test of rancid dairy products is discussed.

Semimicro method for determining copper reduced by sugars, T. G. PHILLIPS (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 181-183; also *New Hampshire Sta. Sci. Contrib.* 79 [1941], pp. 181-182).—Having previously shown that attempts to determine the cuprous oxide, as in most micro- and semimicro-methods for the estimation of sugars in plant extracts, without separating it from the solution in which it is formed introduce a source of error, and that better results are obtained by centrifugal separation (E S R., 69, p. 174), the author has now shown that a slight loss, possibly due to reoxidation during centrifuging, still remains to be corrected. The present method obviates the difficulty by the use of a modified form of the copper sulfate-tartrate-carbonate solution, filtration on a sintered glass filter, re-solution of the cuprous oxide in a ferric ammonium sulfate solution followed by washing the filter with dilute sulfuric acid, and titration of the reduced iron with 0.01 N potassium permanganate solution in the presence of a small addition of orthophosphoric acid and orthophenanthroline ferrous sulfate complex as indicator. Equations shown to express the relation between milligrams of the sugar and the volume of the permanganate solution used are given for glucose, fructose, and sucrose.

AGRICULTURAL METEOROLOGY

Reports and papers, Western Interstate Snow-Survey Conference (*Amer. Geophys. Union Trans.*, 21 (1940), pt. 3, pp. 831-995, figs. 46).—The following papers of interest to meteorology are included: A Quantitative Forecast-System

for Power- and Flood-Warning in the Androscoggin River Basin, Maine, by P. L. Bean and P. W. Thomas (pp. 835-846); A Quantitative Forecast-System of Runoff Based on Snow-Surveys at the Mean Elevation of the Snow-Cover, by J. V. Salo (pp. 858-870); Soil-Moisture Studies as an Aid in Forecasting Runoff From Snow-Cover, by G. D. Clyde (pp. 871-873) (Utah Expt. Sta.); Map of Western Snow-Survey Systems, by J. E. Church (p. 874) (Nev. Sta.); Present Trends in Improving Forecasting in the Humboldt Basin, Nevada, by C. Elges (pp. 874-878) (Nev. Sta.); A Proposed Snow-Survey System for the Yakima Basin, by H. P. Boardman (pp. 878-886) (Univ. Nev.); Report on Snow-Surveys of 1939 in the Chelan Basin (pp. 887-892); The Mountain Snow-Survey—Its Genesis, Exodus, and Revelation, by J. C. Alter (pp. 892-899) (U. S. D. A.); Snow-Activities of the United States Park Service, by R. D. Waterhouse (p. 920); Research on Snow by the Forest Service, by C. A. Connaughton (pp. 920-924) (U. S. D. A.); Some Factors Affecting Frost-Penetration, by H. B. Atkinson and C. E. Bay (pp. 935-948) (U. S. D. A.); The Relation of Snow to Maximum Flood-Peaks, by W. J. Parsons, Jr. (pp. 951-953); The Relation of Snow to Maximum Flood-Peaks—A Discussion, by J. E. Church (pp. 953-968) (Nev. Sta.); Forecast Accuracy of Water-Supply as Made From Snow-Surveys, by R. A. Work (pp. 979-981); Regional Reports for the Northern Watersheds—(1) Accuracy of Oregon Water Supply Forecasts, 1936-1939, by R. A. Work and J. H. Ryan (pp. 981-984) (U. S. D. A. et al.), (2) Accuracy of Stream-Forecasts on the Boise River, Idaho, 1939, by J. C. Marr (p. 984) (U. S. D. A.), (3) Forecasts and Runoff, Lakes Coeur D'Alene and Chelan, 1939, by W. E. Johnson (pp. 984-985), (4) Accuracy of Stream-Forecasts in Montana, by O. W. Monson (p. 986) (Mont. Sta.), (5) Upper Missouri River Forecasts at Fort Peck, 1938 and 1939, by D. B. Freeman (pp. 986-987), (6) Accuracy of Forecasts in British Columbia in 1939, by R. C. Farrow (pp. 987-988), (7) The Accuracy of Forecasts in the Pacific Northwest With Reference Only to the Bow and Saint Mary River Basins, by W. T. McFarlane (pp. 988-991); and Difficulties of Snow-Surveying, by J. V. Salo (pp. 992-995).

Committee on snow, 1939-40, J. E. CHURCH. (Nev. Expt. Sta.). (*Amer. Geophys. Union Trans.*, 21 (1940), pt. 2, pp. 374-396).—A general report including cooperating organizations, the season and snow cover, and regional reports.

Reliability of station-year rainfall-frequency determinations, M. BERNARD and C. F. RUFF (*Amer. Soc. Civ. Engr. Proc.*, 67 (1941), No. 3, pp. 474-482, figs. 2).—A general discussion.

The influence of external factors on the effect of wind on plant transpiration [trans. title], W. GRIEF (*Ztschr. Bot.*, 36 (1940), No. 1, pp. 1-54, figs. 11).—This is a review (34 references) and detailed report of long-time studies of the effects of different soil- and air-moisture contents on the wind-conditioned increases in transpiration of sunflower and *Veronica speciosa* and the influence of wind on cuticular and substomatal transpiration of the above species and of some woody plants and evergreens; and short-time experiments with sunflower under differing light intensity and soil-moisture content and with evergreens in winter.

Desert investigations, F. SHREVE, T. D. MALLEY, E. B. SHREVE, and W. V. TURNAGE (*Carnegie Inst. Wash. Yearbook*, 39 (1939-40), pp. 164-167).—Progress reports on studies of desert vegetation and flora, and of rainfall and evaporation under desert conditions.

Climate of Oregon, J. C. STOVALL and R. E. HOPSON (In *Physical and Economic Geography of Oregon*. [Eugene]: Oreg. State Bd. Higher Ed., [1940], pp. 83-91, figs. 4).

SOILS—FERTILIZERS

Ewald Wollny—a pioneer in soil and water conservation research, L. D. BAVER. (Ohio State Univ.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 330-333).—A review of the work of E. Wollny in relation to present soil and water conservation investigations.

[Soil investigations by the Hawaii Station] (*Hawaii Sta. Rpt. 1940*, pp. 32-35, 86-88, fig. 1).—This report notes work on mineralizable nitrogen in soils, by E. T. Fukunaga; nature of organic phosphorus in soils, by R. Yoshida; soil studies with radioactive phosphorus, by S. S. Ballard and L. A. Dean; polarographic analysis, by Dean; boron studies, by Dean and Tanada; base saturation of soils, by R. Rosendahl and Ayres; and heat-of-wetting studies, by H. A. Wadsworth and E. Inn.

[Soil investigations by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940*, pts. 1, pp. 26-29, 87-97, 97-103, figs. 4; 2, pp. 8-17, fig. 1).—In part 1 progress reports are given on soil and water conservation investigations in Page County and on Muscatine Island; the effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures, as studied by W. H. Pierre; studies dealing with methods of watering pots containing young legume seedlings as used in tests for efficiency of *Rhizobium* cultures, microbial thermogenesis, microbiological status of some soils as affected by waterlogging and erosion, and microbiological aspects of the decomposition of plant materials, by A. G. Norman; investigations on the decomposition of some humus-forming materials in soils, by Norman and R. W. Pearson; the relation of capillary conductivity to the capillary tension and moisture content of soil, and investigations of the factors determining the flow and distribution of water in soil and the development of field apparatus for soil-moisture measurement, both by M. B. Russell; the effect of various natural organic materials at different stages of decomposition on physical and chemical properties of soils which affect erosion, by Russell, Norman, and Pierre; microscopic studies on soil erosion, by J. B. Peterson; the forms of phosphorus in soils and the availability of the different forms to plants, and on potassium availability on different soil types and crop response to potassium fertilization, both by Pearson and Pierre; morphological and chemical characteristics of Iowa soil types, by R. W. Simonson and Pierre; the status of greenhouse investigations to determine nutrient deficiencies of soils, by A. J. Englehorn, Pierre, and Pearson; planning experimental fields for agronomic studies, by H. R. Meldrum, Pierre, Englehorn, and H. D. Hughes; the composition of plants as influenced by soil conditions, soil type, and manurial treatments, by Englehorn and Pearson; and on studies of various cropping adjustments and practices to conserve the soils in Adair County, by Englehorn, Pierre, B. J. Firkins, P. Burson, O. R. Neal, and F. H. Mendell.

Part 2 deals with the effect of various soils and soil-management practices on corn production. The effects of fertilizers on soil conditions and crop yields under various rotation systems and the effects of various amounts of fertilizers applied at different times in rotation in the Wisconsin drift soil area are reported on the basis of work by Meldrum. Soil erosion studies in Page County by Pierre, G. B. MacDonald, J. B. Davidson, and Hughes are discussed, and studies on crop responses to lime, manure, and fertilizers on different soil types by Meldrum and Englehorn and on the value of different phosphate fertilizers by Meldrum, Englehorn, and Pierre are reported.

[Soil investigations by the Maryland Station] (*Maryland Sta. Rpt. 1940*, pp. 26-27, 27, 28-29, 39-40).—The following work is briefly noted: Efficiency of prevailing soil fertility management; and the activities of specific types of micro-

organisms in the transformation of plant materials in soil under various treatments.

Recent trends in soil classification, C. E. KELLOGG. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 253-259).—Soil classification and soil mapping and the relationship of laboratory studies in soil science to field mapping methods are discussed. It is suggested that cooperative efforts on the part of both field and laboratory workers will do much to develop a workable system of soil classification. The author reviews the requirements and units of soil classification with reference to the geographic association of soil units, and states that the differences between soil mapping and soil classification have not always been clearly understood. Soil morphology, slope, erosion, stoniness, and other factors in the field are studied in an analytical process in mapping, whereas classification, on the other hand, is a synthetic process. Soil productivity ratings for each mapping unit offer a promising opportunity for the final synthesis of the data of soil science in specific terms.

New nomenclature of the higher categories of soil classification as used in the Department of Agriculture, J. THORP and M. BALDWIN. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 260-268).—The general purpose and methods of soil classification are considered. Several systems of classification developed by various workers are reviewed. Tables are presented giving a system of soil classification based on soil characteristics. Additions and changes made in the nomenclature of the great soil groups are given.

New soil series names—1938, C. F. SHAW. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 280-287).—Data on 261 new soil series names are considered. Five of these represent conditions and are not true soil series. The area where found, by whom first discovered, and the year discovered are given for each name.

Significance of the soil survey in land-use adjustments on unit demonstration farms, W. W. LEWIS. (Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 312-316, figs. 3).—Land use changes and soil management adjustments are worked out, considering each farm as an individual unit. The importance of soil survey mapping to bring out area delineations important in each type of agriculture is considered. Crop adaptations to different soil conditions should be evaluated. A farm operating plan is prepared, based on land use and soil survey information.

The chemical character of desert soils in relation to their genesis and morphology, I. C. BROWN and M. DROSDOFF. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 269-273).—Two desert soil profiles were collected for detailed study, one from a gentle lower slope of a low, granitic hill about 10 miles northeast of Rosamond, Calif., and the second from the lower part of a broad alluvial fan sloping gently eastward about 3.5 miles north of Mojave. Each of these soils had well-developed clay layers. A detailed description of each profile is given, and results are presented in detail for the soluble salts, exchangeable bases, free iron oxide, and various mineralogical determinations made for each profile. It is indicated that the chemical alteration of the minerals of the soil material in the desert is greater than was suspected.

Effects of irrigation and cropping on soil profiles of desert soils (*New Mexico Sta. Rpt.* 1940, pp. 57-58).—Effects of continued irrigation and cropping as determined by comparison of profiles of the cropped and irrigated soils with those of unbroken soils are briefly noted.

The colloidal constituents of American alkali soils, W. P. KELLEY, W. H. DOBE, and J. B. PAGE. (Univ. Calif.). (*Soil Sci.*, 51 (1941), No. 2, pp. 101-124, figs. 3).—Seven black-alkali and three white-alkali-type soils from several dif-

ferent locations in western United States were investigated to determine the nature of their colloidal constituents. A description of each soil and the place where the sample was collected is given. Data are presented on chemical analysis, silica : sesquioxide ratios, base-exchange and replaceable sodium, dehydration curves, and X-ray investigations for the colloids obtained from the several soils. The soil colloids were found to have a relatively high SiO_2 and CaO content. The SiO_2 : Al_2O_3 ratios were high, being more than 4 for all samples analyzed. Base-exchange capacities ranged from 25.7 to 58.4 milliequivalents. The white-alkali soil colloids gave smooth dehydration curves, whereas the curves for several of the black-alkali soil colloids showed definite breaks. The X-ray analysis revealed that the white-alkali soils contained a mixture of montmorillonitic, kaolinitic, and micallike clays, while the black-alkali soils contained mainly micallike clay. The authors conclude that Sedletzky's³ results are not applicable to American alkali soils. It is suggested that, due to the heterogeneity of soil colloids, fusion analysis of soil colloids cannot be relied on as a definite indication of mineral types present.

Some observations on Ohio River alluvial deposits, R. S. HOLMES. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 323-329, fig. 1).—The mechanical and chemical analyses, as well as that of colloidal material extracted from 13 samples of soil sediment collected at various locations soon after the Ohio flood of January and February 1937, were studied in relation to recent alluvium formations. The mechanical composition of the samples was nearly uniform, with about 26 percent clay and 66 percent silt. The chemical character of the colloids of alluvial materials depended upon the nature of the residual soils from the drainage basins. The colloids of the recent sediments were similar to those from the alluvial soils along the various tributaries of the watershed.

Podzol soils in the Southern Appalachian Mountains, T. S. COLE (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 274-279, figs. 12).—Podzol soils developed on the flat-topped mountains in eastern West Virginia are described. Photographs of several profiles and a detailed description of each horizon are presented. Soil development is considered in relation to climate, nature of forest vegetation, and the kind of parent material.

The base-exchange capacity of the organic and inorganic fractions of several podzolic soil profiles, J. C. F. THOROW and W. S. GILLAM. (Mich. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 3, pp. 223-233, figs. 4).—The base-exchange capacity of each of several horizons of Isabella and Selkirk loams, Rubicon sand, Ogemaw sandy loam, and Kalkaska and Emmet loamy sands was studied, together with that of the organic and inorganic fractions of these same samples.

The base-exchange capacity of Isabella and Selkirk loams was due primarily to the inorganic fraction of the soil, whereas the base-exchange capacity of the four sandy soil types was due principally to the organic fraction. The organic matter present in the A_1 horizons studied accounted for 64 to 86 percent of the base-exchange capacity of these horizons. Similarly, the organic base-exchange capacity constituted from 42 to 62 percent, from 29 to 84 percent, and from 17 to 85 percent of the total base-exchange capacity of the A_1 , B_1 , and B_2 horizons, respectively. The coefficient of correlation between the organic exchange capacity and the percentage organic matter was $+0.90$. A wide variation in the absolute exchange capacity of the organic fraction was noted, not only among the different soil profiles but also between horizons within the same profile. It was concluded that this variation was caused by differences in the chemical

³ Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 22 (1939), No. 8, pp. 510-514, figs. 3.

nature of the organic matter. Exchangeable calcium and magnesium were determined in 15 samples.

The measurement of structural stability and permeability and the influence of soil treatments upon these properties, R. B. ALDERFER and F. G. MERKLE. (Pa. Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 51 (1941), No. 3, pp. 201-212, figs. 4).—Forms of the pipette and sieve methods for aggregate determination and of the pipette method for mechanical analysis are described. Emphasis is placed especially upon the determination of the primary or aggregate particles ranging in average diameter from 2 to 4 mm., the authors being of the opinion that soil constituents of this size are of great importance physically. By plating the results of the aggregate and mechanical analysis percentages against a scale left to right from gravel to clay, the authors calculate a "stability index" $S = 2a - 2m$, in which S = stability index, $2a$ = sum of aggregate analysis percentages to the left of the intersection, and $2m$ = sum of mechanical analysis percentages to the left of the intersection. A further criterion designated "probable permeability" is given as $P = 2a'$, in which P = probable permeability and $2a'$ = sum of aggregate analysis percentages for particles greater than 0.2 mm. Volume weight, percolation rate, and organic matter content are also taken into consideration. Effects of certain cropping practices and treatments upon soil structure, as indicated by the methods described, are noted.

Changes in soil aggregation in relation to bacterial numbers, hydrogen-ion concentration, and length of time soil was kept moist, H. E. MYERS and T. M. MCCALLA. (Kans. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 3, pp. 189-200, fig. 1).—Wide variations in bacterial numbers in a soil of the prairie group were induced by variations in the treatment of the soil and in the length of the incubation period.

Maximum aggregation in no instance coincided with maximum bacterial numbers but lagged behind the bacterial numbers during both the growth and the death phases. The data indicate that bacteria are associated with and responsible for the aggregation of soil particles only insofar as they are responsible for the accumulation of certain metabolic products that function as cementing materials.

Adjustment of the pH of soils within the approximate limits of from 4.1 to 6.7 did not significantly influence the stability of preformed aggregates. Calcium showed no tendency to improve the stability of aggregates. The addition of water to pulverize air-dry soil caused a very sharp and rapid increase in the percentage of water-stable aggregates. This increase occurred in sterilized soils and hence is independent of microbial activity.

A rapid soil test—the 1-gram ball resistance, J. S. PAPADAKIS (*Soil Sci.*, 51 (1941), No. 3, pp. 219-221, pl. 1).—The author determines by means of a simple balance for application for predetermined crushing forces the crushing strength of soil balls made from 1-gm. samples of air-dry soil wetted to the sticky point and air-dried for about 5 days after the forming of the balls. When sodium- and calcium-saturated soils were prepared and tested in this way, soils of high sesquioxide content showed a greater crushing resistance when saturated with calcium but those of low sesquioxide content resisted crushing much more strongly when sodium-saturated. Organic matter decreased crushing strength. In general, soils treated with hydrogen peroxide showed the greatest resistance to crushing. Oven drying gave results definitely different from those obtained with air-dried test pieces.

Calcium saturation and anaerobic bacteria as possible factors in gleization, W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 3, pp. 213-217, pl. 1).—The author briefly reports observations and tests taken to suggest "that the process of gleization may center about the presence of calcium in suffi-

posed. The soybean soil mixture produced approximately 2.25 times as many snap beans per tank as were produced with the corn-soil mixture.

Nitrogen fixation by *Azotobacter chroococcum* in the presence of soil protozoa, R. J. HERVEY and J. E. GREAVES. (Utah Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 2, pp. 85-100).—The nature and extent of the effect of protozoa on nitrogen fixation by *A. chroococcum* in soils, sand, agar, and liquid is reported. When using sterile soil as a culture medium for *A. chroococcum*, it was found that protozoa increased nitrogen fixation provided there is sufficient energy material for the bacteria. When energy material was omitted, the presence of four co-existent species of protozoa, in many cases, depressed nitrogen fixation. Using ciliates as the co-existent organisms in a liquid medium resulted in the greatest nitrogen fixation. In the agar medium there was very little stimulation of nitrogen fixation. *Azotobacter* were more numerous in the presence of protozoa than in their absence in both liquid and soil media. It is believed that a substance, perhaps an organic colloid produced by ciliates, flagellates, and amebas, favors the action of *Azotobacter*.

"Starter" solutions modified to meet 1941 conditions, C. B. SAYRE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 1, 13).—Starter solutions for transplanted crops consisting of from 4 to 8 lb. of very concentrated water-soluble fertilizer salts (for example, a mixture containing a total of 81 percent of plant food and having the fertilizer formula 12-52-17) per gallon of solution were applied at rates up to 200 gal. per acre drilled on the seed in the field and at the rate of 91 gal. per acre for transplanted tomatoes. One of these starter solutions, costing about 80 ct. per acre, has hastened the maturity of tomatoes and increased total yields an average of over 1.5 tons per acre. The one instance of "burning" noted in these experiments occurred in a very acid sand poorly buffered and extremely low in organic matter. Formulas which may be made up from available American-made fertilizer salts are suggested, and their preparation and handling is briefly discussed.

The phosphorus content of a sandy loam containing sufficient available phosphorus for vegetable crops, J. BUSHNELL. (Ohio Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 2, pp. 153-158).—The relationship between phosphorus application to the soil and the amount removed by crops is considered in determining the phosphorus-fixing capacity of the soil. Experiments with four vegetable crops on Chenango fine sandy loam are presented. An annual application of 400 lb. per acre of 16 percent superphosphate resulted in an accumulation of available phosphorus sufficient to maintain the yield of tomatoes and cucumbers for 4 yr. and the yield of cabbage and sweet corn for 8 yr. The total phosphorus content of the soil was about 1,500 lb. per 2,000,000 lb., of which from 100 to 120 lb. were readily extracted by water. The applied phosphorus was accounted for by the estimated removal in the crops and by the accumulation in the plowed horizon, since there was very little or no leaching into the soil at a depth of from 9 to 15 in.

Phosphorus adsorption by five Alabama soils as influenced by reaction, base saturation, and free sesquioxides, W. V. CHANDLER. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 1-12, figs. 6).—The effect of the kinds of cation contained in the base exchange complex and the presence and absence of free iron and aluminum oxides upon the adsorption of phosphorus is given for Decatur, Hartsells, Houston, Norfolk, and Cecil soils. Extraction of the free sesquioxide from the clays decreased the exchange capacity of those high in organic matter but did not appreciably affect those low in organic matter and high in free iron and aluminum oxides. Partially base-saturated clays adsorbed less phosphorus than saturated clays. Cecil and Houston clays were the only ones that adsorbed a considerable amount of phosphorus when saturated

with hydrogen. When saturated with sodium, very little phosphorus was adsorbed by the clays. Removal of the free iron and aluminum oxides from the clays caused a reduction in the phosphorus adsorptive capacity in practically every case. The authors conclude that within the pH range of most acid soils adsorption is due to the formation of iron and aluminum phosphates, while in the neutral to alkaline conditions in high-calcium soils there is precipitation as tricalcium phosphate.

Retention by soils of the sulfur of various compounds as revealed by subsequent plant growth, J. P. CONRAD. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 1, pp. 37-46, fig. 1).—The appearance of sulfur-deficient areas in the West within the past several years has presented a problem on sulfur relationships in the soil. The deficiency of sulfur and the consequent need is most frequently evident in connection with the growing of legumes. Several sulfur compounds were applied to soils deficient in sulfur and the soils subjected to treatment by various percolating solutions. Plant growth studies under the various treatments are also reported. Significant retention of sulfur was found for sodium sulfide, ethanethiol, ethyl disulfide, thioacetic acid, potassium ethyl xanthate, cysteine, cystine, and blood albumin. Marked plant response but no evidence of significant retention was secured for sodium persulfate, sodium sulfate, sodium thiosulfate, sodium sulfite, sodium pyrosulfite, potassium ethyl sulfate, potassium ethane sulfonate, taurine, sodium taurocholate, calcium sulfocarbolate, and egg albumin. Sodium thiocyanate was found to be toxic and showed no evidence of retention.

Some soil factors affecting boron availability, R. L. COOK and C. EL MILLAR. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 297-301, figs. 3).—The research outlined in this paper was an attempt to correlate the occurrence of heart rot of sugar beets with soil conditions. Partial analyses of 130 field soil samples were compared with the incidence of heart rot on the soils sampled. These data show that heart rot occurred more often on alkaline than on acid soils, and a positive correlation was found, within each group separately, between heart rot occurrence and the active calcium content of the soils. No correlation was found between heart rot occurrence and the available B_2O_3 content of the surface soil. Field observations indicated, however, that excessive leaching was conducive to heart rot occurrence. By the use of pot cultures it was discovered that soybeans were easily injured by an excess of borax in the soil and that the toxicity symptoms, which occurred as yellowish-brown spots around the edges of the leaflets, can be recognized easily. Soybeans, accordingly, were used to measure the availability of boron applied to the soil in borax. It was found, thereby, that calcium and magnesium carbonates very effectively fixed boron in some chemical form unavailable to soybeans, while sodium carbonate had no effect on its availability. Calcium and magnesium sulfates caused boron to be partially fixed in a form not available to soybeans in the Hillsdale soil, but they had no effect in the Warsaw soil. Sodium sulfate had no effect in either soil. These results indicate that the boron of borax is fixed in the soil as insoluble borates of calcium and magnesium, which form chiefly in alkaline soils.

Boron as a factor in the calcium metabolism of the corn plant, R. P. MARSH and J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci.*, 51 (1941), No. 2, pp. 141-151).—Investigations are reported on the chemical and structural effect on the corn plant of boron and calcium metabolism. Corn plants were grown in purified sand in highly glazed pots receiving various boron and calcium treatments under the continuous flow method. Plant conditions at various stages of growth, microscopic studies, chemical analyses, and microchemical analysis of the plants are given. It is reported that the optimum boron concentration was limited to

solutions of 0.1 to 0.25 p. p. m. The boron concentration of the solution, within certain limits, does not have a significant influence upon calcium absorption rates, but the presence of sufficient available boron within the corn plant tends to keep the calcium in the plant in an available condition. It is further reported that the amount of soluble calcium in the plant tissue is determined by the boron content in the plant and not by the total calcium of the plant, and that the boron content in the plant is determined by the boron content in the substrate. The authors suggest an important relationship between the boron of the terminal meristem tissues and their pectin content and between boron and fat metabolism.

Farmers advised about use of commercial fertilizers, H. B. PETERSON (*Farm and Home Sci. [Utah. Sta.]*, 2 (1941), No. 1, pp. 1, 10, figs. 2).—In general, N and P are deemed needed in Utah, but not potassium salts, calcium sulfate, or lime. Use of complete fertilizers is therefore economically inadvisable.

Third annual report of the Arizona fertilizer control office, year ending December 31, 1940, W. T. McGEORGE, E. O. FOSTER, A. M. KALAF, and H. VON COLBRITZ (*Arizona Sta. Bul.* 173 (1941), pp. [1]+243-254, figs. 3).—This bulletin presents the usual analytical data (E. S. R., 83, p. 744).

Commercial fertilizer report for 1940, J. T. KELLY and A. R. PATTON (*Montana Sta. Bul.* 387 (1941), pp. 9).—This includes a report of analyses, by Patton, a discussion of fertilizers, by Kelly, of the Montana fertilizer law, and its text as amended in 1939.

Specifications for peat materials, S. A. WAKSMAN, F. E. BEAR, H. R. COX, and H. B. SPRAGUE (*New Jersey Stas. Cir.* 407 (1941), pp. 4).—It is recommended that since peat is of value mainly for its organic matter content but may have an important effect upon soil reaction it should be bought on the basis of specifications stating the kind of peat (moss, sedge and reed, forest peat, or peat soil), its pH value, and its percentage composition with respect to moisture, organic matter, and ash or mineral matter. With reference to other types of organic material used for adding organic matter to the soil, it is stated that "the vendor of these materials should prepare specifications identical with those given for peat, including the name of the product, its reaction (pH), and its content of moisture, organic matter, and ash."

AGRICULTURAL BOTANY

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, [April 1 to September 30, 1936] (*U. S. Dept. Agr., Inventories* 127 (1941), pp. 94; 128 (1941), pp. 45).—No. 127 lists 2,652 and No. 128 lists 1,445 lots of plant material, with descriptive notes in many cases.

[Botanical work by the Maryland Station] (*Maryland Sta. Rpt.* 1940, pp. 40-43, 44-45).—Progress reports are given on the physiological and biochemical aspects of sweetpotato curing and storage; oxygen respiration in wheat in relation to total natural and imbibed water and to the ratio of free and bound water; and life history of *Caryospora putaminum*.

[Abstracts of botanical papers] (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 1s-23s).—Abstracts beginning on the pages indicated are included: Page 1s, Structure of the Shoot Apices in Three Palms [*Phoenix canariensis*, *Washingtonia filifera*, and *Trachycarpus excelsa*], by E. Ball (Univ. Calif.). Page 2s, The Origin of Ray Initials in the Cambium [of Conifers and Dicotyledonous Trees and Shrubs], by E. S. Darghoorn, Jr.; Cell Lengths in the Terminal Meristematic Region of the Stem as Related to Tallness and Dwarfness, by E. A. Bindloss; Phylogenetic Relationships of the Cyperaceae Based Upon Morphological Studies,

by H. W. Blaser (Cornell Univ.); Notes on the Occurrence and General Structure of Sieve Tubes in the Monocotyledoneae, by V. I. Cheadle and N. B. Whitford (R. I. State Col.). Page 3s, Histological and Anatomical Changes Induced by Indole-Acetic Acid in Rooting Cuttings of *Pinus strobus*, by A. L. Delisle; Zonal Structure of the Shoot Apex of *Dioon edule* Lindl., by A. S. Foster (Univ. Calif.). Page 4s, Development of Bright Belt Tobacco Roots in Relation to Soil Moisture, by L. J. Gier. Page 5s, Anatomical Responses of the Valencia Orange Seedling to Changes in Chloride and Hydrogen-ion Concentrations, by H. E. Hayward and E. M. Long (U. S. D. A.); Structure and Development of the Leaf in *Zamia*, by M. A. Johnson (Rutgers Univ.). Page 6s, Studies in the Comparative Embryology of the Fagaceae, by L. M. Langdon; A Biological Study of *Armillaria mellea*, by A. G. Lisi. Page 7s, Physiological Studies on Mosses.—II, Spore Longevity in *Physcomitrium turbinatum* (Michx.) Brid. and *Funaria hygrometrica* (L.) Sibth., by S. L. Meyer (Univ. Tenn.); The Development of the Vascular System of *Phlox* Embryos and Seedlings, by H. A. Miller; The Development of the Cotyledons in *Juglans regia* L., by C. G. Nast; Cytoplasmic Inclusions in the Glandular Epithelium of the Scutellum of *Triticum sativum* and *Secale cereale*, by J. A. O'Brien, Jr. Page 8s, Wound Healing in Certain Field Legumes, by R. W. Poulter; Cytological Observations on *Russula emetica*, by D. Ritchie (W. Va. Univ.); Initiation and Development of Leaf and Floral Organs Determined by Periclinal Chimeras in *Datura stramonium*, by S. Satina and A. F. Blakeslee. Page 9s, Development of Calcium Oxalate Crystals in *Richius* and Their Distribution in Relation to Tissue Differentiation and the Presence of Other Ergastic Substances, by F. M. Scott (Univ. Calif.); The Method of Division in Vacuolate Plant Cells, by E. W. Sinnott and R. Bloch. Page 10s, Initiation of Vascular Tissues in Vascular Plants, by R. H. Wetmore and K. Esau (Univ. Calif. et al.); Cellulose Fibril Formation in the Chloroplast of *Valonia ventricosa*, by W. K. Farr. Page 12s, Germination of Seeds of *Paspalum notatum* Flüggé, by A. M. Andersen, and Diurnal and Seasonal Variations in the Diameters of Cotton Bolls, by D. B. Anderson (both U. S. D. A.); Higher Yields of Hormone From Maize Endosperm, by G. S. Avery, Jr., J. Berger, and B. Shalucha; The Determination and Expression of Yields in Hormone Extractions of Plant Tissues, by G. S. Avery, Jr., H. B. Creighton, and B. Shalucha. Page 13s, The Relation of Certain Air Temperatures and Humidities to Viability of Seeds, by L. V. Barton; Cytochrome Oxidase in Wheat Embryos, by A. H. Brown and D. R. Goddard; Studies on Thiamin in Green Plants, by P. R. Burkholder and I. McVeigh. Page 14s, The Effect of Temperature on Respiration, Protoplasmic Streaming and Transport in Oats, by H. G. du Buy (Univ. Md.); Hormonal Polyploidy in Plants, by H. Dermen (U. S. D. A.). Page 15s, A Preliminary Study of the Effects of Certain Organic [Hormones, Auxins, etc.] Substances Upon Cell Division, by O. J. Eigsti; The Relation of the Fluorescence of Chlorophyll to Photosynthesis in Plants, by C. S. French; On the Inhibition of the First Internode of *Avena* by Light, by R. H. Goodwin. Page 16s, Inhibition of Photosynthesis in *Chlorella* by Means of Minor Elements, by S. S. Greenfield; The Effects of Long Ultraviolet and Near Visible Radiation on Bacteria, by A. Hollaender. Page 17s, Some Factors Influencing the Growth of *Chlorella vulgaris*, by L. H. Leonian and V. G. Lilly (W. Va. Univ.); The Efficiency of Photosynthesis in Relation to Fluorescence, by E. D. McAllister; Induced Formation of β -Gentiobiosides in Growing Tomato Plants, by L. P. Miller; A Possible Role of Vitamin C in Nitrogen Metabolism [of Plants], by G. R. Noggle and F. L. Wynd (Univ. Ill.). Page 18s, Induction of Pseudo-Embryos in *Datura* by Auxin Treatment, by J. van Overbeek, M. E. Conklin, and A. F. Blakeslee; Some Uses of a Spray Chamber in Experimentation With Plants, by M. A. Raines; Relation

of Light to Ascorbic Acid Synthesis by Cowpea Plants, by M. E. Reid; Light as a Direct Controlling Factor in Growth of the First Internode of *Avena*, by C. L. Schneider. Page 19s, Freezable Water Content and the Oxygen Respiration in Wheat and Rye Grain During Growth and Maturation, by H. G. Shirk and C. O. Appleman (Md. Expt. Sta.); The Liberation of Auxin From Plant Tissues, by F. Skoog and K. V. Thimann; Correlative Phenomena in the Culture of Excised Parts of Lettuce Seedlings, by R. B. Stephenson (Univ. Ill.); A Study of the Seasonal Development of the Roots of Several Species of Pasture Grasses, by I. H. Stuckey (R. I. Sta.). Page 20s, A Possible Function of Vitamin B₁ in Protein Metabolism [of Plants], by S. A. Watson and F. L. Wynd (Univ. Ill.); Solanine in the Potato and the Effects of Some Factors on Its Synthesis and Distribution, by M. J. Wolf and B. M. Duggar (Univ. Wis.); Regulation of Tubercization in *Helianthus tuberosus*, by P. W. Zimmerman and A. E. Hitchcock. Page 21s, On the Production and Transport of Thiamin in the Tomato Plant, by J. Bonner; Historical Development of the Woodland Climax in Western North America, by D. I. Axelrod; Local Floras of the United States, by S. F. Blake (U. S. D. A.). Page 22s, Decapitalization of Specific Names, by S. F. Blake (U. S. D. A.); The Species-Problem in *Fagus*, by W. H. Camp; Parallelism in the Upland and Coastal Floras of Eastern United States, and the Theory of Floral Radiation, by L. G. Carr; On the Use of the Terms "Subspecies" and "Variety," by R. T. Clausen (Cornell Univ.); The Genus *Hydrophyllum*, by L. Constance (Univ. Calif.) Page 23s, The Mechanics of the Movement of Vegetation—A Theory of Plant Geography, by C. Epling (Univ. Calif.); Relative Age of Intraspecific Populations of the Southwestern Perennial *Datura*, by J. Ewan; Care and Housing of Botanical Type Specimens, and Local Floras in Relation to Conservation, both by F. R. Fosberg (U. S. D. A.); Flower Buds and Classification, by A. Gundersen; The Flora of the Ruthven Area in Iowa, by A. Hayden (Iowa State Col.). Page 24s, The Piñons or "Nut Pines" of Southwestern United States, by E. L. Little, Jr. (U. S. D. A.); The Lacunae or Cavities in the Nuts of *Juglans* and *Carya*, by W. E. Manning; World Wide Collections of Herbarium Material Necessary for Efficient Study of Economic Plants, by W. T. Swingle (U. S. D. A.). Page 25s, The Relation of Wood Anatomy to the Taxonomy of *Quercus*, by A. H. Tillson (U. S. D. A.); Trends in Plant Taxonomy, by L. C. Wheeler; and *Quercus oglethorpenis*, a New Oak Tree From Georgia, by W. H. Duncan (Univ. Ga.).

A survey of the wild medicinal plants of the United States, their distribution and abundance, H. W. YOUNGKEN ET AL. (*Washington, D. C.: Natl. Res. Council*, [1940], pp. [94, figs. 14]).—"In this first issue on the results of the survey of the commercially available sources of the wild medicinal plants of the United States (April 1937) the Committee on Pharmacognosy and Pharmaceutical Botany of the National Research Council presents a tabulation of those drug-yielding species that in recent years have been found to occur in various localities by its field explorers." Annotated lists with maps are included for Vermont, by W. W. Eggleston; New York, New Jersey, Pennsylvania, Maryland, West Virginia, Virginia, North Carolina, Tennessee, and South Carolina, by Eggleston and J. W. Kelly; Florida, by B. V. Christensen; Georgia, by R. S. Justice; Maine, by F. H. Steinmetz and F. Hyland; and Oregon, by E. T. Stuhr.

Arizona localities of interest to botanists, T. H. KEARNEY (*U. S. Dept. Agr., Bur. Plant Indus.*, [1940], pp. 43).—This annotated list is believed to be fairly comprehensive as regards localities mentioned by collectors of Arizona plants on labels of specimens and in publications.

Alachua County, Florida, soils and violets, W. A. MURRILL (Fla. Expt. Sta.). (*Ecology*, 21 (1940), No. 4, pp. 512-513).—See also a previous note (E. S. R., 84, p. 159).

Some plant immigrants in Florida, E. WEST. (Fla. Expt. Sta.). (*Citrus Indus.*, 21 (1940), No. 7, pp. 1, 13, 17).—A semipopular account of plants introduced into the State.

Distribution and ecology of plants in the waterfowl breeding areas of Iowa (*Iowa Sta. Rpt.* 1940, pt. 1, pp. 137, 138, 139, figs. 4).—A brief report of work by A. Hayden.

Contributions toward a flora of Nevada.—I, Gramineae of Nevada, J. R. SWALLEN. (Coop. Univ. Nev.). (U. S. Dept. Agr., Bur. Plant Indus., 1940, pp. [1]+91).—Keys to the genera and species are included.

Notes on Wisconsin grasses.—I, Additions to the grass flora, L. H. SHINNERS. (Univ. Wis.). (*Amer. Midland Nat.*, 24 (1940), No. 3, pp. 757-760).

Oaks of trans-Pecos Texas, C. H. MULLER. (U. S. D. A.). (*Amer. Midland Nat.*, 24 (1940), No. 3, pp. 703-728, figs. 18).—A taxonomic study, with a key to the species.

A new species of oak from Georgia, W. H. DUNCAN. (Univ. Ga.). (*Amer. Midland Nat.*, 24 (1940), No. 3, pp. 755-756).—*Quercus oglethorpensis* n. sp. is described.

Polyploidy and geographic distribution of species of the genus *Veronica* [trans. title], E. LEHMANN (*Jahrb. Wiss. Bot.*, 89 (1940), No. 3, pp. 461-542, figs. 13).—Over seven pages of references are included.

Notes on Florida fungi, II, E. WEST. (Fla. Expt. Sta.). (*Mycologia*, 33 (1941), No. 1, pp. 38-49, figs. 2).—Notes are included on 30 species, including many rusts and 2 new species (E. S. R., 82, p. 165).

New species of Polyporaceae, L. O. OVERHOLTS. (Pa. Expt. Sta.). (*Mycologia*, 33 (1941), No. 1, pp. 90-102, figs. 12).—Ten new species are described.

List of British Ustilaginales, K. SAMPSON (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 3-4, pp. 294-311).—This is the second of the lists of British fungi (E. S. R., 84, p. 598).

Biatorella resinae: The perfect stage of *Zythia resinae*, T. T. AYERS. (U. S. D. A. et al.). (*Mycologia*, 33 (1941), No. 1, pp. 130-135).—This discomycete from the resin of various conifers was demonstrated to be the perfect stage of *Z. resinae*, and the hosts on which the two stages have been collected during the study and their distribution are given. Inoculations on white pine failed to indicate any parasitism.

Modern experimental design and its function in plant selection, F. YATES (*Empire Jour. Expt. Agr.*, 8 (1940), No. 31, pp. 223-230, figs. 2).

Biochemical investigations, H. A. SPOEHR, J. H. C. SMITH, H. H. STRAIN, and H. W. MILNER (*Carnegie Inst. Wash. Yearbook*, 39 (1939-40), pp. 147-154).—A progress report on studies of the organic nutrition of plants, use of radioactive CO₂ in photosynthesis, oxidation-reduction reactions of killed leaves, the state of pigments in leaves, and the origin of hexenaldehyde obtained from leaves.

Halophytes, J. C. T. UPHOF (*Bot. Rev.*, 7 (1941), No. 1, pp. 58).—In this monographic review (363 references) the author discusses the general aspects, physiology, morphology, genetics, and cytology of halophytes, the salt contents in soils and waters, the distribution of halophytes geographically and within the plant kingdom, saltbushes, dominance in the open sea, dissemination of fruits and seeds, mangroves, inland halophytes, and culture of halophytes.

Influence of soil temperature on the uptake of nutrient elements by spring wheat, T. T. DEMIDENKO and R. A. BARINOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 4, pp. 403-405).—Spring wheat was found to develop and complete its growth cycle more rapidly at high than at low temperatures. Under nitrogen or phosphorus deficiency, but with temperatures high, the yields were greater than at low temperatures. Under potassium de-

iciency the plants also developed more rapidly at high than at low temperatures, but this was also attended by a more energetic uptake of potassium. At different temperatures the plants exhibited but little differences in their transpiration coefficients, which were more strongly influenced by the fertilizer treatments.

Studies on thiamin in green plants with the *Phycomyces* assay method, P. R. BURKHOLDER and L. McVEIGH (Univ. Mo. et al.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 853-861, figs. 9).—"The authors . . . report on *Phycomyces* assays for thiamin activity in certain inbred lines and hybrids of maize grown on varied supplies of nitrogen and phosphorus in sand culture. Brief attention is given to the technique and validity of the methods, together with a discussion of growth factors for *Phycomyces* contributed by plant tissue added to certain kinds of synthetic media."

Relationships between zinc and auxin in the growth of higher plants, F. SKOOG (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 939-951, figs. 7).—Using tomatoes and sunflowers grown in highly purified culture solutions in the greenhouse, terminal buds and stem sections from Zn-deficient plants yielded no auxin or only traces by diffusion into agar blocks or by ether extraction. Leaf tissues yielded appreciable amounts, but much less than the controls. Controls contained auxin concentrations higher than required for optimum stem elongation. Auxin decreases preceded the appearance of visible symptoms of Zn deficiency. Under extreme Zn deficiency, a large increase in auxin occurred within one to several days after adding Zn to the culture solution, but resumption of growth was delayed for several more days. That Zn is required for normal auxin content, rather than that auxin decrease is a secondary effect of decreased vigor, was confirmed by the contrasted behavior of Cu- and Mn-deficient cultures. Increased capacities for auxin destruction and for oxidation were found to be correlated and are believed to be causally related. In red or weak light, minus-Zn cultures maintained a high auxin content and continued to elongate for long periods, whereas in blue light decreases occurred in early growth stages. Indoleacetic acid in the nutrient solution or sprayed on the leaves may increase stem growth in the early stages of Zn deficiency but does not replace Zn as a nutrient, the effect apparently being on the utilization of available Zn. Zn content, light conditions, and perhaps other external factors greatly influence the response to applied growth substance. It is concluded that Zn is not principally required for auxin synthesis, but for its maintenance in an active state. Lack of Zn leads to excessive destruction of auxin. This in turn causes growth retardation and abnormalities in correlative functions. On this basis it is believed that the present results, as well as numerous observations in the literature on the effects of Zn on growth, can be coordinated and at least partially understood.

Wound healing in higher plants, R. BLOCH (*Bot. Rev.*, 7 (1941), No. 2, pp. 110-146).—In this comprehensive, critical review (200 references), dealing with the theoretical and practical aspects of wound healing, the author discusses organ structure and wound responses in stems, roots, cotyledons, leaves, and fruits; induction of meristematic activity, including dedifferentiation, necrotic changes and wound hormones, cell division and growth, and cell and tissue differentiation; growth substances and wounding; and plant neoplasms.

Sap pressure and oxidation, P. J. KRAMER (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 929-931).—In a study of sap exudation from freshly cut stumps and bore holes in *Acer rubrum*, *Betula nigra*, and *Carpinus caroliniana* (total of over 75 small trees) during February and March of 3 consecutive years, cups filled with acid fuchsin solution were attached to the trunks. When holes were drilled into the trunks beneath the surface of the solution, no dye penetration took place during exudation, but it started when exudation ceased, which usually occurred

in the afternoon. Similar results were obtained with the stumps. There was no indication of subatmospheric pressures in the xylem from which exudation was occurring. Exudation clearly occurred from the xylem vessels of the woody species used, and this is apparently true also of herbaceous species. The contrary conclusions of James and Baker (E. S. R., 70, p. 756) are believed to be the result of the small number of trees studied, the fact that their experimental species (*A. pseudoplatanus*) has a very low exudation rate, and the use of an unsuitable technic. Since exudation was occurring both at the beginning and end of their experiments, it apparently was assumed to have occurred throughout, which has been shown not to be true. Actually, periods of positive pressure and exudation are often followed by subatmospheric pressure and absorption of dye.

An attempt to record internal tree-trunk pressures, A. P. BEILMANN (*Shade Tree*, 13 (1940), No. 9, pp. [6-7]).—Using an automatic instrument of the "dash-pot" type described, the experiments reported appeared to indicate that "internal pressure" differing from atmospheric pressure does not occur in normal, sound trees.

Advances in enzymology and related subjects, I, edited by F. F. NOB and C. H. WERKMAN (New York: Interscience Pubs., Inc., 1941, vol. 1, pp. X+433, figs. 56).—The following are of interest to botany: Photosynthesis, Facts, and Interpretations, by J. Franck and H. Gaffron (pp. 199-262); The Bacterial Photosyntheses and Their Importance for the General Problem of Photosynthesis, by C. B. van Niel (pp. 263-328); and Investigations of Enzymic Processes in Living Plants [trans. title], by A. L. Kurssanov (pp. 329-370.)

The quantum efficiency of photosynthesis, R. EMERSON and C. M. LEWIS (Carnegie Inst. Wash. Yearbook, 39 (1939-40), pp. 154-158).—A progress report.

Chlorophyll content in wheat seedlings as influenced by vernalization, A. A. ZAITZEVA (Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 3, pp. 271-273).—Increased chlorophyll content of young seedlings was found in winter wheat over spring wheat and in vernalized over nonvernalized seeds. However, the differences in chlorophyll content conditioned by vernalization or growth habit were gradually smoothed out as the seedlings advanced in age, none being distinguishable at the outset of tillering. Incomplete vernalization also favored chlorophyll accumulation in the early developmental stages of the seedlings.

Influence of cooling on the rate of greening of etiolated wheat seedlings, A. A. ZAITZEVA (Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 3, pp. 274-276).—Under the experimental conditions, chlorophyll accumulation in young seedlings was greatly furthered by temporary cooling.

The influence of photoperiod on the development of the peanut (*Arachis hypogaea*) [trans. title], T. A. LEBEDEVA (Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 3, pp. 264-266).

The ontogenetic development and phylogenetic specialization of rays in the xylem of dicotyledons.—I, The primitive ray structure, E. S. BARCHHOEN, JR. (Amer. Jour. Bot., 27 (1940), No. 10, pp. 918-928, figs. 17).

The embryogeny of *Cunninghamia*, J. T. BUCHHOLZ (Univ. Ill.). (Amer. Jour. Bot., 27 (1940), No. 10, pp. 877-883, figs. 19).—A study of the embryogeny of the ornamental China "fir" (*C. lanceolata*), completed in the season of pollination and fertilization, is presented and illustrated in detail.

Demonstration of the three germ layers in the shoot apex of *Datura* by means of induced polyploidy in periclinal chimeras, S. SATINA, A. F. BLAKESLEE, and A. G. AVERY (Amer. Jour. Bot., 27 (1940), No. 10, pp. 895-905, figs. 5).—Histological and cytological study of 68 periclinal chimeras of *Datura*, obtained by treating seeds for 3-8 days with 0.2-0.4 percent colchicine solutions, demon-

strated the presence of 3 independent germ layers in the shoot apex. These are described, illustrated, and discussed in detail.

Macrosporogenesis and development of the embryo-sac in *Musa textilis* nee ("Putian"), F. T. ENCAENACION (*Univ. Philippines, Nat. and Appl. Sci. Bul.*, 7 (1940), No. 4, pp. 389-400, pls. 3).—A cytomorphological developmental study of Manila hemp (abaca).

A phytochemical and histological study of *Purshia tridentata* (Pursh) D. C., C. V. NETZ, C. H. ROGERS, and G. L. JENKINS. (*Univ. Minn. and U. S. D. A.*). (*Jour. Amer. Pharm. Assoc.*, 29 (1940), No. 11, pp. 480-485, figs. 2).

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 41 (1941), No. 2, pp. 259-276).—The following are of interest to botany: The Electron Optics of the Electron Microscope, by J. Hillier (p. 259); Structural Differentiation Within the Bacterial Cell, by S. Mudd and D. B. Lackman (pp. 259-260); Pictures of Bacterial Forms Taken With the Electron Microscope, by K. Polevitzky (p. 260); The Significance of Fermentation Studies in the Classification of the Lactic Acid Bacteria, by C. S. Pederson (pp. 267-268) (N. Y. State Expt. Sta.); Fermentation of Cellulose by Microorganisms Associated With Termites, by E. C. Hendee (p. 268); Selective Bactericidal Agents, by R. J. Dubos (p. 260); A Method for the Bacteriological Examination of Flat Surfaces, by W. G. Walter and G. J. Hucker (p. 273) (N. Y. State Sta.); The Action of *Rhizobium* on Tissue Containing Selenium, by J. K. Wilson and H. D. Aughtry, Jr. (p. 274) (Cornell Univ.); and The Value of Fluorescence Microscopy for Demonstrating Acid-Fast Organisms, by E. K. Kline and R. E. Leach (p. 275).

The anaerobic bacteria and their activities in nature and disease: A subject bibliography.—Supplement 1, Literature for 1938 and 1939, L. S. McCLEUNG and E. MCCOY (*Berkelcy: Univ. Calif. Press*, 1941, pp. XXII+344).—Section 1 of this supplement is essentially a continuation of volume 1, and section 2 of volume 2, of the previously noted bibliographic monograph (E. S. It., 81, p. 417). An important change in form is the publication of the complete citations, including titles of the articles, within each subject section.

The dissimilation of phosphoglyceric acid and hexosediphosphate by *Aerobacter indologenes*, R. W. STONE, M. N. MICKELSON, and C. H. WERKMAN (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 3, pp. 253-260).—"The presence of phosphoglyceric acid and hexosediphosphate exerted a stimulating effect on the utilization of glucose by *A. indologenes*. Sodium fluoride (0.02 M) diminished the rate of utilization of glucose and strongly inhibited the utilization of the phosphate esters in the presence of glucose. In the absence of glucose, phosphoglyceric acid was not attacked appreciably, either in the absence or presence of sodium fluoride. Glucose was fermented to normal final products in the presence of 0.02 M NaF by *A. indologenes*. Hexosediphosphate was readily fermented to the same products as glucose."

GENETICS

Breeding for resistance to crown rust, stem rust, smut, and desirable agronomic characters in crosses between Bond, Avena byzantina, and cultivated varieties of *Avena sativa*, H. K. HAYES. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 164-173, fig. 1).—Results obtained in Minnesota from crosses of Bond oats with cultivated varieties of *A. sativa* are summarized, with particular attention to the performance of Bond crosses in advanced generations, in individually spaced plots, and in row trials. Bond oats, used extensively in Minnesota as a parent in crosses with *A. sativa* varieties, was found to excel in resistance to crown rust and smut, in plumpness of grain, and in ability to withstand lodging. Data on inheritance of characters differ-

entiating *A. sativa* and *A. byzantina* oats (E. S. R., 81, p. 635) and on reaction to crown rust, stem rust, and the smuts showed that resistance to the three diseases may be combined with the desirable characters of the two parents. Many Bond crosses tested in replicated rod-row trials have equaled or surpassed Bond in weight per bushel. Certain ones appeared outstanding in ability to yield and to withstand lodging, indicating that Bond is desirable as a parent in crosses with varieties of *A. sativa*.

Inheritance in rice of reaction to *Helminthosporium oryzae* and *Cercospora oryzae*, C. R. ADAIR. (Coop. Ark. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 772 (1941), pp. 19).—This study indicates that reaction to *H. oryzae* is controlled by several genetic factors, and that in crosses studied resistance was recessive. There was a fairly close relationship between reaction to *H. oryzae* on seedlings grown in the greenhouse and that on mature plants grown in the field. Time of heading and lemma and palea apex color are monogenic characters inherited independently, and both are apparently independent of the factors for reaction to *H. oryzae*. Difficulty was encountered in classifying plants for reaction to *C. oryzae*, but by carrying the studies through the second, third, and fourth generations the main genetic factors for reaction to this fungus were determined. Supreme Blue Rose (susceptible) has at least one factor for reaction to *C. oryzae* dominant to that for reaction to *C. oryzae* in the resistant varieties used. The factor for reaction to *C. oryzae* in the resistant varieties is dominant to that for susceptibility to *C. oryzae* in the Zenith, Early Prolific, and Carolina Gold varieties. Probably a number of modifying factors are involved. The factor for reaction to *C. oryzae* is not closely linked with factors for the other characters studied. Resistant selections having the desired plant characters were obtained. Differences in reaction to *C. oryzae* appear to be due to physiological rather than morphological or anatomical differences in rice varieties, and these physiological differences are inherited.

Some objectives in breeding for yield and other agronomic characters in wheat, W. W. WORZELLA. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 174-180).—Several pertinent objectives that should aid in the breeding of superior wheats, discussed and analyzed, included an inventory of all the wheat varieties and their characteristics; analysis of characters, e. g., yield, winter hardiness, drought resistance, and "external dress"; development of specific tests for identifying and accurately measuring wheat characteristics; search for new and superior germ plasm; and more fundamental research in nature and behavior of characters.

Inheritance of seed-coat color in peanuts, B. B. HIGGINS. (Ga. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 10, pp. 745-752).—The testa color of 85 varieties and strains of peanuts (*Arachis hypogaea*) and of hybrid progenies from crosses among these varieties were separated into red, flesh, and white color groups. Flesh-colored testa was found dominant to genetically pure white with a bigenic difference, indicating that all flesh-colored varieties studied possess two identical genes for color. Red testa was dominant to flesh with a single factor difference, but flesh pigment was necessary for expression of red color. Two varieties with white seed coats differed in genetic constitution. The Pearl variety seemed to carry factors for both red and flesh pigment but to lack factors for expression of color, while Philippine White has neither pigment but carries factors for development of color.

Some foliar characters for peach breeding, F. W. HOFMANN. (Va. Expt. Sta.). (*Va. Acad. Sci. Proc.*, 1940, pp. 208-209).—A conspicuous olive green spotting on older full-grown leaves of the peach could not be identified as a plant disease or a physiological disorder nor could it be transferred by grafting

from affected to healthy shoots. That the phenomenon was of genetic nature was indicated by the fact that the crosses between spotted and nonspotted plants showed an intermediate stage in the first generation. (Crosses between large-spotted and small-spotted stocks produced progeny with an intermediate stage.

An interesting association in the peach was between the color of the first etiolated leaves and that of the fruit flesh. If the leaves were yellow to yellow ochre, the flesh was yellow. If the leaves were pale or light yellow, the flesh was white or cream-colored. If the hypocotyl was reddish, the fruit was bluish with a tendency toward redness around the pit.

Chromosome number in some *Gladiolus* hybrids, R. RAMFORD, R. E. JONES, and W. C. LEAVENWORTH. (Univ. Md.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, p. 28).—This is a brief abstract.

Crossing relations of some diploid species of roses, J. C. RATSEK, S. H. YARNELL, and W. S. FLOEY, JR. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 983–992).—Using as parents species that have been reported to be diploid, data are presented (largely in tabular form) on the degree of fertility or sterility in a large number of crosses. The relative ease with which a cross could be made was an indication of genetic similarity, as shown in an average of 44.7 percent set among species of *Cinnamomeae* and only 15.6 between species of *Cinnamomeae* and those of a distinct group.

[Studies with *Viola*]. (Univ. Vt.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 38, 48).—Abstracts of the following papers are presented: *Phylogenetic Relations and Technic in the Grafting of Species of *Viola**, by J. D. Dodd; and *Contrasting Progeny of Allopolyploids in the Genus *Viola**, and *The Male Gametophytes in Some Species of Violets*, both by A. Gershoy.

A red maple, silver maple hybrid, O. M. FREEMAN. (U. S. D. A.). (*Jour. Hered.*, 32 (1941), No. 1, pp. 11–14, figs. 3).—An account is given of the successful hybridization of red and silver maples. Only a few dozen normal fruits were produced from several thousand flowers, suggesting a high degree of incompatibility. The various forms of red maple have 36, 54, and 72 chromosomes and the silver maple has 26. The hybrids begin blooming in their sixth year and the variation in type of growth, leaf type, and rate of growth showed a wide variation.

[Investigations in animal genetics by the Iowa Station] (*Iowa Sta. Rpt.* 1940, pt. 1, pp. 103–105, 106–108, 112–114, 130).—Results are reported on progress of investigations (E. S. R., 82, p. 755) by J. L. Lush, C. Y. Cannon, E. N. Hansen, P. S. Shearer, C. C. Culbertson, M. D. Helser, F. J. Beard, A. L. Anderson, E. L. Quaife, B. H. Thomas, J. A. Schulz, H. L. Wilcke, R. E. Phillips, and G. F. Stewart on inbreeding Holstein-Friesian cattle and Poland China swine; predicting record of sows' productivity; amount and kind of inbreeding and other breeding practices in the early development of Hampshire sheep; value of Danish Landrace swine in the development of improved strains; crosses of various swine breeds; evaluation of swine breeding stock based on growth, gain, ability to utilize feed, and carcass quality of the progeny; and operative technic for hypophysectomy in the fowl.

The inheritance of color in the milk of Guernsey cattle, J. W. BARTLETT, R. P. REECE, and J. D. COWLING. (N. J. Expt. Stas.). (*Guernsey Breeders' Jour.*, 59 (1941), No. 4, pp. 281–285, figs. 2).—Milk color measurements on a rather large Guernsey cow population gave evidence that milk color is about one-third as variable as is milk volume and somewhat less variable than butterfat percentage. Milk color trends at different levels of carotene intake indicated that the color potentiality of a Guernsey cow is a fixed attribute. Heredity appeared to be somewhat more important than environment in determining milk color under average feed conditions, but under widely varying feed conditions environ-

ment became much more important than heredity. Coefficients of correlation are presented for milk color relationships of dam-daughters, full sisters, paternal half sisters, and maternal half sisters. Related animals proved definitely more alike than unrelated animals in their milk color. The highest degree of correlation was found to exist between dams and daughters. Both sires and dams varied in their ability to transmit high milk color, with certain animals exhibiting prepotency for a definite color level.

Three hereditary anomalies in pigs, S. BERGE (*Hereditas*, 27 (1941), No. 1-2, pp. 176-192).—The occurrence of abnormalities designated as paralyzed hind legs (lethal shortly after birth), scrotal hernia, and atresia ani among pigs produced at the Pig Breeding Station of the Agricultural College of Norway is described. Analyses of the proportion of pigs in affected litters led to the conclusion that paralyzed hind legs was due to a recessive gene and that scrotal hernia was dominant with dominance incomplete. This conclusion thus differs from Warwick's findings of two recessive factors for scrotal hernia (*E. S. R.*, 56, p. 129). The mode of inheritance of atresia ani was uncertain, but a two-factor case is suggested, although it was impossible to say whether one or both were dominant or recessive. Congenital blindness was more probably caused by environmental conditions, such as vitamin A deficiency, than by hereditary factors.

Effect of crossing inbred lines of guinea pigs, O. N. EATON (*U. S. Dept. Agr., Tech. Bul. 765* (1941), pp. 19, figs. 9).—Study during the calendar years 1916 to 1937 of the fertility, growth, and viability of the previously noted five inbred strains of guinea pigs and crosses between them (*E. S. R.*, 67, p. 27) showed that different sets of genes govern these characteristics in the different lines. Heterosis was most strongly manifested in F_2 hybrids by increased viability of the young before and after birth. Crosses between the families low in weight at birth and weaning showed gains over both parents, but the hybrids of both heavy and light families tended to follow closely those of the heavier strain. Increases in fertility were not very marked except in crosses between strains of medium fertility. Variation in the reciprocal crosses for all three characteristics tended to follow that of the dam's strain. Mating took place more regularly when sires and dams were unrelated, but there was little difference in the age at which first litters were born. The combination of three inbred families produced somewhat greater fertility and viability than where two families were involved. No one inbred strain showed superiority over others in all characteristics, but all were inferior to the control stock. The longest-lived inbred strain, family 2, out-lived hybrids with other families.

Quantitative histologic studies on the anterior pituitaries of various strains of guinea pigs, J. M. WOLFE and O. N. EATON. (*U. S. D. A. et al.*). (*Amer. Jour. Anat.*, 67 (1940), No. 3, pp. 347-360).—Significant differences between certain inbred families and control stock of guinea pigs that have been shown to differ in morphological characters and mortality (*E. S. R.*, 82, p. 32) were found in the histology of the anterior pituitaries of representatives of these families and control stock from Nashville, Tenn. There were significant differences between most of the families in the percentage of eosinophiles and chromophobes, but the basophiles and colloid droplets did not show such differences except between the inbred families and the Nashville control stock. Mitotic figures occurred more frequently in anterior pituitaries from immature than mature animals. There was no sex difference in any of the cell types.

Genetic aspects of egg weight observed during inbreeding experiments, N. F. WATERS. (Iowa Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 14-27, figs. 9).—Employing methods of Lush and Arnold (*E. S. R.*, 78, p. 95), the author

calculated that 55 percent of the variance in weight of eggs produced by 3,200 inbred and random-bred White Leghorns, Rhode Island Reds, Light Brahmas, and New Hampshire and crossbred pullets was genetic. The genetic portion of the variance in all except inbreds was 74 percent, and in the inbreds it was only 46 percent. Thus egg weight was seen to be a highly hereditary trait. The correlation between egg weights of dams and their daughters was 0.3763. As the degree of inbreeding increased from 1926 to 1937 there was a decrease in the average egg weight from 55-56 gm. in 1926 to 50-52 gm. in 1937 in the six inbred families described by Waters and Lambert (E. S. R., 75, p. 763). There was no significant increase or decrease in the weights of eggs produced by topcrossed, inbred, or random-bred Leghorns. Cross-breeding studies indicated that large egg size was controlled by several genes which were largely dominant to small egg size. The inbreds were largely homozygous for small egg size. Progeny from dams laying the largest eggs and sires from a small-egg line gave progeny with a mean egg weight of 55.3 gm. The reciprocal cross produced progeny with a mean egg weight of 58.9 gm., suggesting a sex-linked influence. The maternal influence on egg weight was more important than that of the paternal parent. The correlations between the weight of eggs produced by the sires' dams and full sisters of the sires and their daughters were 0.23 and 0.24, respectively, both being nonsignificant. The failure to show the sire's influence in many matings is incompatible with the sex-linkage hypothesis, although the presence of the W chromosome has been questioned.

Differences in sexual maturity and egg production of turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 51-56, fig. 1).—By selection over a 5-yr. period, early- and late-maturing strains of turkeys were developed which differed significantly in date of first egg and in egg production throughout the year. In reciprocal crosses of the two lines the progeny of early-maturing ♂s × late-maturing ♀s laid significantly earlier than the progeny of the reciprocal cross, but the latter progeny were considerably earlier maturing than the late-maturing strain. These results were interpreted as indicative of the operation of both autosomal and sex-linked genes in controlling the date of first egg. In addition to date of maturity and total production, information was recorded on the number of pauses in egg production and the egg weight. Turkeys differed from chickens in that turkeys usually reached maximum first-year body weight slightly after laying was started, whereas chickens lay for several months before maximum first-year weight is reached.

[Results of experiments in reproduction and fertility in horses and poultry by the Maryland Station] (*Maryland Sta. Rpt.* 1940, pp. 37, 67-71, figs. 2).—Brief progress reports are included on the diagnosis of pregnancy in mares, fertility in roosters and formation of eggs and production in hens as influenced by gonadotropic hormones and lighting, physiology of egg formation, and breeding for resistance to pullorum disease.

The relationship of ascorbic acid to reproduction in the cow, P. H. PHILLIPS, H. A. LARDY, P. D. BOYER, and G. M. WERNER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 153-158).—Continuing studies on the role of ascorbic acid in reproduction in cattle (E. S. R., 84, p. 173), data obtained on cows of different dairy breeds showed an average ascorbic acid content of plasma of 0.39 mg. percent. Breed differences were noted, the Holstein averaging lower than the Guernsey in this respect. A higher concentration of ascorbic acid in the plasma occurred in mid- to late oestrus than in dioestrus. However, little difference was noted in the peak concentration during oestrus in good to poor breeders. Of 17 "hard to settle" cows subjected to ascorbic acid therapy, 10 conceived at the first mating after treatment, while no beneficial effect of the

treatment was evident in the remainder, indicating that such treatment is of value in treating certain types of sterility in the cow. It is further noted that α -tocopherol was ineffective in restoring tone to a toneless uterus.

Importance of light in sexual development of birds, E. SVETOSAROV and G. STREICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 4, pp. 398-401, figs. 3*).—Study of the comb, testis, ovary, and oviduct size of fowls exposed to additional and reduced light showed that the effect of light on the development of gonads is confined to the functional period. Modification of the light treatment before 60 days of age had no influence on sexual maturity.

Effect of castration on the homing faculty of the carrier pigeon, A. P. ORLOV, B. G. NOVIKOV, and A. A. WOITKEWITSCH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 4, pp. 406-408, fig. 1*).—Castrated homing pigeons maintained practically the same speed as normal controls in returning from flights of from 51 to 195 km. Thus, the sex hormone is not a factor contributing to the homing faculty. There was a greater proportion of castrates than normals returning from flights, and castrates had less difficulty if they were lost. Molting was somewhat earlier in castrates than in controls.

Analysis of sex dimorphism in the growth of birds, G. STREICH and E. SVETOSAROV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 4, pp. 402-405, fig. 1*).—Differences between the growth rate of δ and φ ducks were offset following castration, leading to the conclusion that the φ sex hormone inhibits the growth rate. The organs showing sex differences in growth rate were similar after castration. The small increase in the weight of the castrated as contrasted with normal δ and φ ducks at 120 days was attributed to increased fat deposits.

Differentiation of sera of two species of doves and their hybrid, R. W. CUMLEY and M. R. IRWIN. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 44 (1940), No. 2, pp. 353-355*).—Comparison of the absorption of precipitins from the sera of Pearlneck and ringdoves and hybrids between them by antisera of immunized rabbits showed that the sera reacted at the same dilution, and no distinction could be made between them. However, a differentiation of the serum protein was possible by absorption of the antiserum of one species by the serum of the other. The species-hybrid appeared to possess the precipitinogens of both parental species.

Are results of gonadotropic assay performed on the intact immature rat valid? R. T. FRANK and R. L. BERMAN (*Endocrinology, 28 (1941), No. 2, pp. 211-215*).—The secretion of the luteinizing factor of the hypophysis was stimulated by oestrogen priming 48 hr. before gonadotropic hormone was first administered to immature φ rats. Without priming, additional luteinization was not induced in 96 hr.

Purification of follicle-stimulating hormone (FSH) of the anterior pituitary, H. L. FRAENKEL-CONRAT, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 2, pp. 627-630*).—The biological properties of a further purified preparation of the follicle-stimulating hormone are described (E. S. R., 83, p. 45).

Gonadotropic and augmentative effects of testosterone propionate in immature female rats, C. F. FLUEMANN (*Endocrinology, 28 (1941), No. 2, pp. 214-216*).—The subcutaneous administration of testosterone propionate to immature φ rats in three doses daily for 2 days induced the formation of a few large follicles and an occasional corpus luteum. The effect on the ovarian weight from chorionic gonadotropins was more than doubled in rats previously treated with 15 mg. of testosterone propionate. The effects, however, were not so apparent when anterior-pituitary-like hormone or equine gonadotropins were administered after the testosterone.

The effectiveness of androgens during inanition in the chick, W. R. BRENNEMAN (*Endocrinology*, 28 (1941), No. 2, pp. 222-228, fig. 1).—Continuing these studies (E. S. R., 80, p. 181), the author found that chicks on a limited feed intake were less variable in their comb growth during 10 and 15 days than on a normal ration. During the 15-day period, the variability was reduced when body weight was taken into account. Evidence was presented to indicate that variation in testis weight on account of the androgens secreted served as the basis for another correction factor. It was estimated that a considerable part of the dose level of 0.0025 mg. of dihydroandrosterone benzoate was necessary for the initiation of comb growth. There were employed 536 chicks in this study, from which it was possible to predict the comb growth from certain hormone doses within from 2 to 5 percent.

Effect on body growth of small doses of testosterone propionate administered at different seasons, H. S. RUBINSTEIN and M. L. SOLOMON (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 745-748).—Small doses of testosterone were found to enhance growth in weight and length beginning with 26-day-old rats in the fall, winter, and summer. However, abnormally rapid growth was not produced in animals whose treatment began in April. Thus seasonal influence is a factor to be considered in studying the relation of this δ hormone to growth. The optimum dosage of testosterone for maximum growth was 0.05 mg. per day.

Mutual antagonism between oestrogens and androgens, C. W. EMMENS and T. E. T. BRADSHAW (*Jour. Endocrinol.*, 1 (1939), No. 4, pp. 378-386, figs. 3).—Oestrone, oestradiol, and diethylstilboestrol administered by inunction or injection were found to have an antiandrogenic effect on the capon comb test. Their effectiveness was much greater when administered by inunction than when administered by injection. The approximate amounts of oestrogen in micrograms necessary to inhibit the action of 600 μ g. of androsterone when given by inunction and injection, respectively, were 16 and 7,500 for oestrone, 96 and 1,750 for oestradiol, and 1,600 and 3,000 for diethylstilboestrol. About 500 μ g. of testosterone, methyl testosterone, androstenedione, and androstenediol inhibited the response of spayed mice to oestrone in doses of 0.5 mg. of each.

The ovary of the adult rat.—II, Changes in the follicular apparatus during pregnancy, C. E. LANE (*Anat. Rec.*, 78 (1940), No. 1, pp. 31-41, figs. 2).—Continuing these studies (E. S. R., 82, p. 467), the author found that the total volume of the theca and granulosa of the ovary of the rat during pregnancy was least on the eleventh day of gestation. According to the cytological changes observed, the mitotic activity of the follicles was apparently inhibited between the eighth and sixteenth days of gestation by placental secretions.

The effect of aging in the female genital tract on the fertilizing capacity of guinea pig spermatozoa, A. L. SODERWALL and W. C. YOUNG (*Anat. Rec.*, 78 (1940), No. 1, pp. 19-29).—Sperm introduced by artificial means into the genital tract of \varnothing guinea pigs were effective in causing fertilization when ovulation was not more than 22 hr. later, but after 17 hr. there was a decrease in the percentage of fertility. The size of the litter, gestation, and development of the embryos were normal. Abortions were frequent but not more frequent after delayed fertilization. It thus appears that sperm are adapted to longer life in the \varnothing genital tract than \varnothing gametes. These studies were performed on 259 \varnothing s under day and night observation, and ovulation was considered to occur 10 hr. after the beginning of heat. Some \varnothing s whose ova were fertilized never came in heat, indicating the difference between willingness to mate and cyclic changes in the genital tract essential for pregnancy.

Comparative activity of naturally occurring estrogens on the infantile rat uterus and vagina, R. I. DORFMAN (*Soc. Expt. Biol. and Med. Proc.*, 45

(1940), No. 2, pp. 594-596, fig. 1).—In their descending order of activity in causing hypertrophy of the uterus and producing vaginal introitus from 5 daily subcutaneous injections in immature ♀ rats, oestrogens were found to rank as α -oestradiol, oestrone, and equilin. The effects were determined in graded doses. In such tests it was curious that α -oestradiol and its monobenzoate were approximately equal, whereas oestrone was definitely more active than its monobenzoate.

Estrogen in the urine of normal and vitamin E depleted rats, E. BEEB STECHER, JR. (*Endocrinology*, 28 (1941), No. 2, p. 344).—During pregnancy, excretion of oestrogen in the urine by rats was found to be about six times the normal amount. E-depleted ♀s showed normal values for about 12 days, after which oestrogen was reduced, agreeing with the time of resorption of the fetuses.

The effect of progesterone on the gonadotrophic potency of the rat's pituitary, H. BREROWS (*Jour. Endocrinol.*, 1 (1939), No. 4, pp. 417-419).—To further investigate the role of progesterone on reproduction (E. S. R., 82, p. 759) and the influence of the corpus luteum hormone, ♀ rats were injected with four daily doses of 5 mg. each of progesterone. On the fifth day the pituitaries from these animals were implanted in immature ♀ mice. It was found that the uteri, vaginas, and ovaries of these mice were less than these organs of control ♀s in which pituitaries from untreated rats were implanted.

Mammalian and avian assays of hypophyseal lactogenic preparations, W. B. LYONS. (Univ. Calif.). (*Endocrinology*, 28 (1941), No. 2, pp. 161-170, figs. 3).—Female guinea pigs and pigeons gave similar results in the comparative assays of purified hypophyseal lactogenic preparations and the international standard. It was pointed out that unless the guinea pigs weighed over 650 gm. the mammary glands were so rudimentary that they would not respond to the treatment. It was also necessary to inject the guinea pigs during the first 3 days of the oestrous cycle, but reactive animals could be used repeatedly.

Growth of the reproductive and endocrine organs of the female rabbit, C. W. EMMENS (*Jour. Endocrinol.*, 1 (1939), No. 4, pp. 409-416, figs. 6).—Analogous to the studies by R. Deaneely and I. W. Rowlands of growth of the reproductive and endocrine organs of the guinea pig,* study was made of the association of changes in body weight and growth of the ovaries, uteri, thyroids, adrenals, and pituitaries of 83 virgin Dutch and Himalayan rabbits from 280 to 2,640 gm. in weight.

FIELD CROPS

[Crops research at the Mesa, Ariz., experiment farm] (*Arizona Sta. Bul.* 171 (1941), pp. 159-160, 162-176, 179-180, figs. 33).—Practical findings are reported from irrigation tests with cotton and wheat; cultural tests with cotton, flax, and sugar beet varieties for seed; experiments on heating methods and insulating materials for sweetpotato hotbeds; Johnson grass control experiments; variety tests with cotton, grain sorghum, barley, oats, flax, soybeans, and legumes for green manure; and trials of new crops.

[Agronomic experiments in Hawaii] (*Hawaii Sta. Rpt.* 1940, pp. 4 9-15, 47-49, 75-77, 79, 81, pl. 1, figs. 7).—Research by J. C. Ripperton, E. Y. Hosaka, R. A. Lyman, F. T. Murphy, M. Takahashi, E. M. Hodges, D. Sumida, W. W. Jones, H. D. Michener, H. F. Clements, and E. K. Akamine with field crops and related agronomic studies (E. S. R., 83, p. 479), again reported on briefly, comprised the introduction and evaluation of pasture species; studies of the persistence of pasture grasses and legumes; adaptation and fertilizer tests with clovers; improvement and management of Napier grass; breeding work with

* *Jour. Anat.* [London], 70 (1936), No. 3, pp. 331-338, figs. 9.

Sudan grass and Guinea grass; methods of breaking dormancy and increasing germination of seeds of *Paspalum notatum*, *Panicum prolatum*, and *Pennisetum ciliare* and *P. setosum*; trials of sorghum varieties; determination of starch content of taro; variety, cultural, fertilizer, and seed storage and treatment tests with potatoes; and research on factors affecting the germination (E. S. R., 83, p. 621) and production of sugarcane.

[Farm crops research in Iowa]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940, pt. 1, pp. 29-30, 64-72, 73-86, 136-157, 141, 142, 146-147, 220-221, 222-223, 224-225, 226-227, 228, 265, 268-269, figs. 6*).—Progress results (E. S. R., 82, p. 762) are reported from work by C. P. Wilsie, H. R. Meldrum, L. C. Burnett, H. D. Hughes, M. G. Weiss, C. Y. Cannon, J. L. Robinson, H. C. Murphy, C. S. Reddy, W. H. Pierre, C. C. Culbertson, J. J. Wallace, J. N. Martin, I. E. Melhus, W. F. Buchholtz, E. L. Waldee, R. H. Porter, A. T. Erwin, P. A. Minges, G. S. Shepherd, G. W. Snedecor, G. M. Cox, W. G. Cochran, C. Winsor, J. M. Aikman, R. E. Buchanan, and E. C. Volz in breeding oats, barley, wheat, soybeans, sweetclover, red clover, bromegrass, potatoes, and sweetpotatoes; variety tests with oats, wheat, barley, flax, bluegrass, red clover strains, alfalfa on bacterial wilt-infected soil, sweetclover, lespedeza, soybeans, potatoes, and sweetpotatoes; adaptation studies with Mukden and Kanro soybeans and Loglos barley; measurements of the length of corolla tubes, observations on seed setting, and hybridization of red clover strains; effect of late spring clipping on seed yields of sweetclover; effect of cutting red and alsike clovers at different stages of maturity; a companion or nurse crop experiment with red clover; the influence of heavy fertilization with phosphate or manure on winter injury of three red clover strains; relative value of sweetclover, red clover, and dalea as green manures; fertilizer and varietal factors affecting storage quality and fertilizer, spacing, and propagation tests with sweetpotatoes; sugar production and storage in the sugar beet planted at several dates on different soil types; permanent pasture improvement, including determination of the relative carrying capacity of Kentucky bluegrass pasture as affected by grazing management, effect of reseeding and different soil treatments on carrying capacity and on vegetative population, adaptation, productivity, and palatability of promising grasses used in pastures in southern Iowa on soils at different levels of productivity, comparison of quick-growing crops to provide early pasturage and for use as nurse crops in establishing stands of grasses and clovers, and the extent to which grass sod should be subdued and a seedbed prepared in advance of seeding clovers; differential response of soybean varieties to rate and date of planting; structure of seed coat and environmental factors pertaining to germination of weed seeds; the germination of normal, immature, and injured seeds of pigweed (*Amaranthus* spp.) found in crop seeds, 1936-39; control of bindweed; and interrelations among meteorological environment, soil condition, growth response, and yield of corn.

[Field crops research in Maryland] (*Maryland Sta. Rpt. 1940, pp. 20-23, 23-25, 26, 27-28, 75*).—Progress results are reported from agronomic studies (E. S. R., 82, p. 763), including breeding work with corn, wheat, and barley; genetic studies with corn; variety tests with corn and hybrids, wheat, barley, grain sorghum, soybeans, alfalfa, lespedeza, and red clover; fertilizer trials with early and late potatoes; improvement of permanent pastures in the several soil provinces of Maryland, and flowering and seed production in certain pasture plants as related to vegetative growth; effects of fertilizer on fertility and grass population of pastures; and the plant production value of different kinds of forage crop seed.

[Field crops research in New Mexico]. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1940, pp. 14-27, 29-31, 32-35, 66-69, 71-72, 74-77, figs. 2*).—Work

with field crops (E. S. R., 83, p. 48) reported on from the station and outlying fields included variety tests with winter- and spring-sown wheat and barley, oats, corn for grain and silage, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets for yield and curly top resistance, alfalfa, soybeans, cowpeas, mung beans, annual hay crops, and miscellaneous forage crops; breeding work with sugar beets, wheat, barley, cotton, soybeans, and pinto beans; cultural, seed treatment, and irrigation tests with cotton and potatoes; fertilizer experiments with sugar beets, cotton, and alfalfa; tests of safflower and sunflower; tests of different forms of sulfur and crop sequences with cotton; effects of different irrigation treatments on maturity, lint, and yield factors of Acala cotton, and labor requirements for production; studies of the annual production of sugar beet seed, concerned with effects of preceding crops and fallow; studies of the restoration of ranges by natural and artificial revegetation; and control of bindweed by hoeing, burning, and different herbicides.

Dry land crops at the Dalhart (Texas) field station, O. R. MATHEWS and B. F. BARNES (*U. S. Dept. Agr. Cir. 564* (1940), pp. 68, figs. 6).—The crop production experiments reported on, largely with grain sorghum and sorgo, 1908–38, were concerned with crop adaptations, continuous cropping v. alternation with fallow, rotations, strip cropping, soil moisture, and varieties and rates and dates of planting sorghums. Information is included on appropriate cropping practices, characteristics of the area and its climate, wind erosion, and the *Pythium* root rot of milo.

Sorghum yields have been affected by crop sequence, the methods of preparing the land and of planting, time and rate of seeding, and by the variety planted. The use of the fall and winter precipitation as a guide to determine when land preparation should begin may result in higher yields than the consistent use of any one method. While small grains generally have been unproductive, yields following cultivation that began soon after harvest were much higher than those obtained where land preparation was delayed until shortly before planting. Fallowing increased yields of all crops, but with most crops the increase was not enough to justify the use of much fallow in a cropping system. No advantage was gained by starting cultivation of row-crop land for fallow earlier than June of the fallow year. Manure increased both the grain and forage yields of sorghums in favorable years, but decreased grain yields in unfavorable years and apparently was of benefit only to the crop treated. Crops after green manure were less productive than those after summer fallow. Soil that had suffered wind erosion produced yields that were much lower than those from normal soil in favorable years but higher in adverse years. The fertility of eroded land was not restored by green manures. The soil moisture studies with sorghums showed that the quantity of available water in the soil at planting time had a determining effect on the yield. The chief value of a large quantity of water in the soil at planting time was that it was still in the soil available for use during the critical heading period. Adapted varieties, including those noted earlier (E. S. R., 69, p. 205; 72, p. 470), and recent root rot-resistant milos and other sorghums and dates and rates of planting are discussed briefly.

Effect of day length and temperature on the flowering and growth of four species of grasses, H. M. BENEDICT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 9, pp. 661–671, figs. 2).—Records made on plants grown in the greenhouse under different conditions of day length and temperature indicated that *Agropyron smithii* (bluestem) is a long-day plant, *Bouteloua gracilis* (blue grama) of indeterminate day length, and *Andropogon furcatus* (bluejoint turkeyfoot) and *Panicum virgatum* (switchgrass) short-day plants. Dry weights of plants of *Agropyron smithii* were not affected by day length, but plants in the

with field crops (E. S. R., 83, p. 48) reported on from the station and outlying fields included variety tests with winter- and spring-sown wheat and barley, oats, corn for grain and silage, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets for yield and curly top resistance, alfalfa, soybeans, cowpeas, mung beans, annual hay crops, and miscellaneous forage crops; breeding work with sugar beets, wheat, barley, cotton, soybeans, and pinto beans; cultural, seed treatment, and irrigation tests with cotton and potatoes; fertilizer experiments with sugar beets, cotton, and alfalfa; tests of safflower and sunflower; tests of different forms of sulfur and crop sequences with cotton; effects of different irrigation treatments on maturity, lint, and yield factors of Acala cotton, and labor requirements for production; studies of the annual production of sugar beet seed, concerned with effects of preceding crops and fallow; studies of the restoration of ranges by natural and artificial revegetation; and control of bindweed by hoeing, burning, and different herbicides.

Dry land crops at the Dalhart (Texas) field station, O. R. MATHEWS and B. F. BARNES (*U. S. Dept. Agr. Cir. 564* (1940), pp. 68, figs. 6).—The crop production experiments reported on, largely with grain sorghum and sorgo, 1908–38, were concerned with crop adaptations, continuous cropping v. alternation with fallow, rotations, strip cropping, soil moisture, and varieties and rates and dates of planting sorghums. Information is included on appropriate cropping practices, characteristics of the area and its climate, wind erosion, and the *Pythium* root rot of milo.

Sorghum yields have been affected by crop sequence, the methods of preparing the land and of planting, time and rate of seeding, and by the variety planted. The use of the fall and winter precipitation as a guide to determine when land preparation should begin may result in higher yields than the consistent use of any one method. While small grains generally have been unproductive, yields following cultivation that began soon after harvest were much higher than those obtained where land preparation was delayed until shortly before planting. Fallowing increased yields of all crops, but with most crops the increase was not enough to justify the use of much fallow in a cropping system. No advantage was gained by starting cultivation of row-crop land for fallow earlier than June of the fallow year. Manure increased both the grain and forage yields of sorghums in favorable years, but decreased grain yields in unfavorable years and apparently was of benefit only to the crop treated. Crops after green manure were less productive than those after summer fallow. Soil that had suffered wind erosion produced yields that were much lower than those from normal soil in favorable years but higher in adverse years. The fertility of eroded land was not restored by green manures. The soil moisture studies with sorghums showed that the quantity of available water in the soil at planting time had a determining effect on the yield. The chief value of a large quantity of water in the soil at planting time was that it was still in the soil available for use during the critical heading period. Adapted varieties, including those noted earlier (E. S. R., 69, p. 205; 72, p. 470), and recent root rot-resistant milos and other sorghums and dates and rates of planting are discussed briefly.

Effect of day length and temperature on the flowering and growth of four species of grasses, H. M. BENEDICT (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 9, pp. 661–671, figs. 2).—Records made on plants grown in the greenhouse under different conditions of day length and temperature indicated that *Agropyron smithii* (bluestem) is a long-day plant, *Bouteloua gracilis* (blue grama) of indeterminate day length, and *Andropogon furcatus* (bluejoint turkeyfoot) and *Panicum virgatum* (switchgrass) short-day plants. Dry weights of plants of *Agropyron smithii* were not affected by day length, but plants in the

other species growing in long days had the greater dry weights. A low night temperature increased dry weights of plants of *A. smithii* and *Andropogon furcatus* in both long and short days and also increased dry weights of plants of *P. virgatum* growing in a short day. It decreased dry weights of plants of *B. gracilis* growing in both day lengths and also that of plants of *P. virgatum* growing in a long day. Root: top ratios of plants of *A. furcatus* and *P. virgatum* were greater in short days than in long days. Marked differences between ratios of plants of the other two species growing in different day lengths were not observed, nor were there significant differences between root: top ratios of plants of the four species when grown in a low night temperature and in a high night temperature in either day length. Day length and temperature appeared to affect markedly the growth and flower production of these four grasses, and indications were that good growth and blooming could be obtained in the greenhouse in winter by properly controlling, among other things, these two factors.

Some growth characteristics of perennial hay and pasture crops: Adjusting pasturing and cutting practices to them. V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 131-134).—Grazing, hay-cutting, and root reserve studies demonstrating certain growth habits of perennial hay and pasture crops, to which cutting and grazing practices may be adjusted to the advantage of the farmer, have been noted extensively from other sources (E. S. R., 77, p. 332; 79, p. 473; 81, pp. 207, 777).

Use of T. V. A. phosphates and limestone on pastures.—A progress report, W. W. WOODHOUSE, JR. (*North Carolina Sta. Agron. Inform. Cir.* 129 (1941), pp. [2]+6, figs. 5).—Pasture experiments conducted in cooperation with the T. V. A. in 1940 on Halewood silt loam under conditions approximating moderate grazing and good management showed that triple superphosphate, calcium metaphosphate, and fused phosphate all produced satisfactory increases, and that substantial and profitable responses were made to applications of phosphate and limestone. Phosphate seemed to be the main factor in increasing quality of herbage and limestone to influence principally the yield. There was some indication that the higher rates of phosphate might be more effective, but 2 tons of limestone probably was not more beneficial than 1 ton. White clover, lespedeza, and bluegrass all seemed to respond to treatment, but lespedeza appeared to have the lower phosphate requirement. As shown by analyses of the 1939 harvest, applications of phosphate, especially, and limestone produced definite increases in N, Ca, P, and ash.

Bromegrass production in Nebraska. A. L. FROLIK and L. C. NEWELL. (Coop. U. S. D. A.). (*Nebraska Sta. Cir.* 68 (1941), pp. 16, figs. 10).—Practical information, derived extensively from station experiments and experience, is given on the characteristics of bromegrass (*Bromus inermis*); its climatic and soil adaptation; cultural requirements; usage and management for pasture, hay, rotations, seed production, and soil conservation; and the harvesting and cleaning of the seed.

Ladino clover. C. EBY (*New Jersey Stas. Cir.* 408 (1941), pp. 7, fig. 1).—Soils, fertilizers, dates, rates, and methods of planting, and seeds mixtures are recommended for Ladino clover (*Trifolium repens latum*) from experiments of the station, and comments are made on the merits of and ways to handle the crop for hay, silage, and pasture, and on its persistence. Tests at the Dairy Research Farm, 1933-40, indicated that superphosphate and potash must be supplied regularly to maintain a satisfactory stand.

[Corn research in Iowa]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt.* 1940, pt. 2, pp. 14, 19-20, 22-29, 30-34, 36-42, 45-48, figs. 4).—The corn investigations (E. S. R., 83, p. 50) reported on by J. B. Davidson, E. V. Collins, H. R. Meldrum,

G. F. Sprague, C. K. Shedd, H. J. Barre, J. L. Robinson, G. Semenluk, A. L. Bakke, R. M. Hixon, W. G. Gaessler, R. H. Porter, M. S. Zuber, R. C. Eckhardt, W. H. Pierre, L. A. Tatum, J. C. Eldredge, H. D. Hughes, L. C. Burnett, E. W. Lindstrom, J. N. Martin, W. E. Loomis, and J. M. Aikman as projects under the Iowa Corn Research Institute dealt with genetic relations of inbred lines, including second- v. first-cycle inbred lines, intensity of inbreeding in relation to fixation of genes, mutations in inbred lines, and mapping of chromosomes; genetic transfer of starch characteristics in corn; genetic studies; improving inbred lines by crossing followed by selfing and sibbing; improvement through use of inbred lines; growth response of hybrids and varieties on soils of different fertility levels; tests of varieties, strains, and hybrid combinations in different parts of Iowa; a comparative study of stem and root development of corn varieties as to anatomical features at successive stages of development; measurement of limiting environmental factors in growth of the plant at different rates and spacings; hill spacing of check planted corn; surface drilling, listing, and basin listing methods of planting corn; translocation gradients in the plant and their relation to photosynthesis and yield; interaction of water, growth hormones, and food supplies in the development of corn, especially effects of light, of water supply, of temperature, and growth of inbred and hybrid corn; maintenance of pure seed sources of improved varieties through field inspection and certification; production and distribution of seed of corn hybrids and of their parents; and breeding, varietal, storage, and popping studies with popcorn. Other work related to corn production had to do with seed increase of new or improved varieties of oats, popcorn, and soybeans, techniques used in seed analysis, physiology of field bindweed (*Convolvulus arvensis*), and weed control in growing corn.

Corn varieties, hybrids, and cultural practices, S. V. STACY (*Georgia Sta. Cir. 126 (1941), pp. 15*).—Experiments with corn at the station, 1921–40, are reported, with suggestions for growing the crop in Georgia. The amount and distribution of rainfall during the growing and developing period were observed to influence the yields more than the total rainfall for the year.

Leading white varieties included Neal Paymaster, Piedmont 2-eared, and the Hastings, Whatley, and Legg Prolifics, and the leading yellow varieties Good Golden Prolific, Mathewson Golden, and Jarvis Golden. Hybrids produced in the South were superior to northern hybrids in their longer and tighter husks, stronger plants, and higher average yields. Yield differences indicated the merits of growing superior varieties.

Corn bedded and planted in the water furrow averaged 33.3 bu., planted in open furrow on land turned flat 28, and planted on top of bed 21.4 bu. The crop could be planted from April 1 (27.3 bu.) until May 15 (22.0 bu.), early to medium plantings giving highest acre yields. Close spacings (21 in. in 3.5-ft. to 16 in. in 4.5-ft. rows) returned larger yields than wider spacings (42 in. in 3.5-ft. to 32 in. in 4.5-ft. rows). Interplanting with legumes reduced the yield of corn, although increasing the tonnage of dry matter per acre. Corn alone averaged 29 bu. per acre, with velvetbeans planted at the same time 16.9 and 3 weeks later 23.5, and with soybeans at corn planting 23.3 and 3 weeks later 26.5 bu. The value of growing winter legumes to insure against soil erosion and to increase corn yields was evident.

Measuring hybrid corn for Michigan, 1938–1940 trials, H. C. RATHER and A. R. MARSTON (*Michigan Sta. Quart. Bul., 23 (1941), No. 3, pp. 134–151, figs. 4*).—The current and 3-yr. performances of corn hybrids (E. S. R., 83, p. 52) in tests under the direct supervision of the station in seven counties are tabulated and discussed, and the results of 10 supplementary trials in other counties in 1940 reported (pp. 140–151) by A. A. Johnson. Hybrids tested for more than 1 yr. are grouped and their approximate adaptation indicated on an outline map.

Testing corn variety and hybrid performance in North Dakota, W. WIDAKAS (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 4, pp. 16-21).—Yields of grain and fodder by corn varieties and hybrids are reported from cooperative tests and station experiments, 1938-40. Suggested varieties and hybrids for the southeastern area of the State are, for heavy and cold soils, Minhybrid 402, Wisconsin 279, Kingscrot A, and Minhybrid 401, and for lighter, more fertile soils, Minhybrid 401, Kingscrot A, Minnesota 13 (Mund strain), Kingscrot D4, TruKrost 170, and Wisconsin 355; in the east-central area and very favorable areas in central and western North Dakota, Minhybrid 402, Wisconsin 279, Kingscrot 125, TruKrost 100, Haney strain of Minnesota 13, and Rainbow flint; and for the northeastern area and most of western and northern areas, early strains of Falconer, Northwestern, and a number of early flint varieties. In more favorable areas with light and fertile soil growers may select some of the earlier hybrids, as Wisconsin 279, Minhybrid 402, Kingscrot 125, TruKrost 100, and Kingscrot E.

The Ohio cooperative corn performance tests, G. H. STRENGFIELD, R. D. LEWIS, and H. L. PFAFF. (Coop. U. S. D. A., Ohio State Univ., et al.). (*Ohio Sta. Spec. Cir.* 61 (1941), pp. 30, fig. 1).—Data on acre yields, dry matter in ears at harvest, days from planting to silking, lodged and broken plants, and aphid infestation are reported for hybrids and open-pollinated corn varieties harvested from 45 tests grown in 1940 in 12 adaptation areas in Ohio, as in similar tests reported earlier (*E. S. R.*, 82, p. 765).

Viking flax, O. A. HEGGENESS (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 4, pp. 7-8).—Viking flax, a selection from B-Golden \times Burbank Golden made by the author in 1926, has a medium-sized golden yellow seed, pale pink flowers and yellow anthers, grows about 18 in. tall, and is rust- and wilt-resistant enough for land not too badly infected with flax wilt (*Fusarium lini*). It is not as wilt-resistant as Bison, deemed the safest flax on severely infected land, and is susceptible to pasmo. Viking withstands more spring frost than Bison, Buda, or Linota. Although it is about 6 in. shorter than Bison, in a normal year on good land Viking grows tall enough for harvest with a binder and generally will produce as high an acre yield with oil of better quality.

Culture and fertilizer studies with peanuts, U. R. GORM (*Georgia Sta. Bul.* 209 (1941), pp. 19, fig. 1).—Varieties, culture, fertilizer and harvesting practices, and disease control methods are outlined, and reports are made on seed treatment, fertilizer, and rotation experiments with the crop.

Good increases in stand and yield followed treatment of peanut seed with 2 percent of an organic mercury dust in 1940. The greatest increases came from machine-shelled seed and pegs, for in shelling a large percentage of the seed coats is scratched or broken. Hand-shelled seed gave the best stand and yield, and seed in the hull the poorest.

Fertilizer experiments with Spanish peanuts in cooperation with farmers, 1937-40, showed that on most soils the best increases were obtained from 400 lb. of a 6-6-6 fertilizer. This may be applied before planting, as 300 lb. of a 3-8-8 plus a side application of 100 lb. sodium nitrate per acre, or by placing 150 lb. of superphosphate per acre under the peanuts and side dressing with a mixture of sodium nitrate 150 lb. and potassium chloride 50 lb. The few experiments conducted with North Carolina Runner peanuts seemed to indicate that they do not respond as well as the Spanish to fertilizers, especially N. A mixture of 16-percent superphosphate about 150 lb. and potassium chloride 50 lb. is suggested.

A study of cropping histories showed that consistently high yields came from fields which had been in cotton 1 yr. or more before and were well fertilized.

Best yields of peanuts appear to have been obtained after cotton or tobacco. An objection to following cotton with peanuts is the tendency for mold (*Sclerotium rolfsii*) to occur in scattered areas in the field. Growers also find considerable mold in peanuts after a crop of cowpeas. A suggested 3-yr. rotation for south Georgia is described.

Fertilizer experiments with potatoes on the marl soils of Dade County, W. M. FIFELED and H. S. WOLFE (*Florida Sta. Bul. 352 (1940), pp. 40, figs. 5*).—The effects of fertilizer analyses, amounts, sources of N and K, and applications of Mn and other soil amendments on yields of Bliss Triumph potatoes grown on the marl soils of Dade County, near Homestead, Fla., were studied, 1931-40.

Tests of analyses ranging from a 2-8-5 and 3-12-8 to 8-16-10 gave results indicating that for mixtures to be applied at rates of about 1,500 to 2,000 lb. per acre for increases beyond 3 or 4 percent N, 8 percent phosphoric acid and 4 or 5 percent K were not justified. With ordinary 4-8-5 and 3-12-8 analyses the best amounts were from about 1,500 to 2,000 lb. per acre, and usually the most profitable rate was 1,500 lb. A 4-8-5 mixture in which 33 percent of the N came from organic sources produced as well in 4 of 5 yr. as mixtures with a higher content of organic N. No definite relation of treatment yields to monthly rainfall during the crop season was observed during the 5 yr.

The organics milorganite, blood-and-bone tankage (medium grade), and dried blood slightly and profitably outyielded other sources. Fish scrap, cottonseed meal, urea, and cyanamide yielded slightly less, about the same as mixtures having all their N from ammonium phosphate, ammonium sulfate, or sodium nitrate. No advantage came from combining the latter two materials or fish scrap and cottonseed meal. Urea and cyanamide treatments produced yields in the upper range of the water-soluble sources and were among treatments showing lowest fertilizer cost per bushel. In a 4-8-5 fertilizer significant differences in yield were not obtained when ammonium sulfate and sodium nitrate were compared as inorganic carriers of N with 50 percent of the N from organic sources or between potassium sulfate or chloride as sources of K. Stable manure applied at from 6 to 8 tons per acre with commercial fertilizer increased yields slightly but not enough to justify the cost.

Applications of 100 lb. of 65 percent manganese sulfate per ton of fertilizer gave as good yields as larger amounts. It was found that on "new" land manganese sulfate should be applied annually for at least the first 4 yr. After 5 yr. or more of successive applications, results indicated that Mn could be omitted from the fertilizer at least 1 yr. without decreasing the yield. Applications of magnesium sulfate, copper sulfate, iron sulfate, borax, iron citrate, S, and calcium sulfate failed to increase yields profitably. Zinc sulfate increased yields in some seasons but results were too inconsistent to warrant its general recommendation as a fertilizer ingredient.

Response of two clonal strains of Triumph potatoes to various controlled environments, H. O. WERNER. (Nebr. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 11, pp. 761-790, figs. 15*).—Further studies (E. S. R., 73, p. 313; 83, p. 766) were made to determine whether potato varieties or strains can be analyzed as to adaptation to various latitudes by testing them under controlled conditions with the photoperiods and at temperatures characteristic of certain latitudes. The progressively changing day lengths and temperatures typical of potato growing seasons in southern and northern United States were simulated in the greenhouse. Plants of two vegetatively differing clonal lines of Triumph, growing under these conditions with 11- and 16-hr. days and with different levels of N nutrition, were harvested at frequent intervals.

With 11-hr. cool days (62°-65° F.) plants were very small with high leaf : stem and tuber : top ratios; and tubers set very early on a few short stolons, increasing rapidly in size early in the season, completing growth before the seventy-fifth day after plant emergence and having a high content of dry matter. The 16-hr. cool-day plants in comparison were much larger, had lower leaf : stem and tuber : top ratios, set more tubers several weeks later on longer stolons, and growth continued longer and finally attained about twice as much weight but with smaller daily increases in tuber dry weight per weight of leaves. Plants under "southern" conditions resembled 11-hr. cool-day plants except for slightly later and less extensive tuberization. "Northern" condition plants were much like 16-hr. cool-day plants. Restricting the N in nutrient solution for northern condition plants resulted in earlier cessation of vegetative growth, reduction in leaf : stem ratio, much earlier tuberization, reduction in number of tubers, greater tuber weight and higher tuber : top ratios early but eventually less, lower dry matter content in all parts, and possibly lower starch content. Changes due to restriction of N were similar although less pronounced under southern conditions.

The initial vegetative growth of the very early strain (Nebraska Triumph 12) generally exceeded that of the very late strain (Nebraska Triumph 23). Where conditions favored vegetative growth early or throughout the season, that of the late strain was greatest, but the strains differed little in this respect when early conditions did not favor such growth. External shortage of N always inhibited vegetative growth of the early strain most. Early-strain plants, compared with late-strain plants, were most leafy, had highest leaf : stem ratios, least extensive stolon growth, formed tubers earlier, and had higher tuber : top ratios and greater tuber production per day per gram of leaf weight. Under northern conditions or with 16-hr. cool days, late-strain plants came into tuberization much later than the early strain, but differences were much less under southern or 11-hr. day conditions with restricted N. Early-strain plants produced the greatest total weight of tubers except when conditions late in the season greatly favored tuberization. Differences in dry matter and starch content of tubers were attributable to size and physiological age of tuber and not to strain differences. The late strain could survive adverse conditions and respond to improved nutritional conditions better than the early strain.

This method of periodic harvesting of plants grown under controlled environmental conditions seemed much more satisfactory for determining significant physiological differences between clonal strains than field trials in different parts of the country. "The results indicate that intrinsic differences between strains are much less evident or important in southern localities where the conditions early in the season are extremely favorable for tuber development than in northern late-potato regions where the plants start their growth in the hot mid-summer days."

Soy beans in North Dakota, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 4, pp. 3-5).—Suggested methods are outlined for growing soybeans for seed and hay in North Dakota, together with a brief report on varietal behavior and choice and comments on the uses and limitations of the crop. Yields under comparable conditions at Fargo indicated that other annual hay crops usually produce a larger tonnage of hay, although soybeans rank high in production of digestible protein.

Toxic effect on germinating sugar-beet seed of water-soluble substances in the seed ball, B. TOLMAN and M. STOUT. (U. S. D. A.) (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 11, pp. 817-830, figs. 5).—Seed balls from different varieties of sugar beets differed widely in rate and total germination even though an equiv-

alent number of seed balls from each variety contained mature seed. Such differences were largely dissipated when the naked seeds, removed from the seed ball, were germinated or when seed balls from different varieties were washed thoroughly before the germination test. The amount of water-soluble substances present in seed balls varied with variety and also within seed lots of the same variety grown in different years or localities, and possibly was affected by climate, soil, and maturity of the seed when harvested.

Water-soluble substances contained in the corky pericarp of sugar beet seed balls were found to result in a toxic effect to germinating seed under laboratory conditions, causing a reduction in rate and total germination percentage and an actual killing of the radicles. Removal of the true seed from contact with the surrounding pericarp or thorough washing of the seed balls eliminated the injurious effects. Soaking the seed balls in a volume of water sufficient to insure dilution of toxic substances was definitely beneficial but not so effective as washing in running water. The desirability of an amplification of the pre-soaking treatment currently followed by commercial seed laboratories was indicated.

Seasonal distribution of rainfall in relation to yield of winter wheat, J. E. PALLESEN and H. H. LAUDÉ (Coop. Kans. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 761 (1941), pp. 12, figs. 4*).—Studies of the influence of rainfall throughout the crop season on the yield of winter wheat at Colby, Garden City, and Hays in western Kansas for the period 1909–35 indicated that rainfall is of greatest advantage to winter wheat in western Kansas before and during the period from planting to the time wheat enters the winter semidormant stage.

Rainfall over the 3 mo. prior to planting wheat (July to September) was very important, but less so, however, than that during October and November, when the benefit of each inch of rainfall above average was over 3 bu. on fallowed land and slightly less than 3 bu. on continuously cropped land. Beneficial effects of rainfall decreased after December 1, until in February and March more than average rainfall became slightly detrimental. A second less important period of beneficial effect of above-average rainfall is during the period of rapid stem growth and heading. From April 15 until near harvest slightly above-average rainfall was associated with increased yields, although the influence was less marked than for rain during the fall and early winter.

The direct result of a given increment of rain appears to depend partly on soil conditions, as shown by differences observed between curves for continuous and fallow cropping systems (*E. S. R.*, 75, p. 338; 80, p. 38).

Spring wheat varieties at the Mandan Station, J. C. BRINSMADÉ, JR. (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 4, pp. 21–23).—Varieties leading in average acre yield for different periods within the years 1930–40 included Vesta, Rival, Premier, Thatcher, Hope \times Hard Federation, Pilot-13, Pilot B, and Hope-44 \times Ceres.

Seed inspection, F. A. McLAUGHLIN (*Massachusetts Sta. Control Ser. Bul. 107 (1940), pp. 104*).—The germination, purity, and weed seed contents are tabulated for the official samples of field crops seed and mixtures and germination for samples of vegetable seed collected in the State during the period December 1, 1939, to November 1, 1940. The report also includes results of field tests for trueness to type and variety on lots of beans, beets, broccoli, cabbage, carrots, corn, onions, peppers, radish, and turnip, in cooperation with G. B. Snyder; studies of flower seeds, in cooperation with C. L. Thayer, including tests for purity, germination, and performance; and type and performance studies with samples of seed corn, in cooperation with W. G. Colby.

HORTICULTURE

[Horticultural studies at the Salt River Valley Substation] (*Arizona Sta. Bul. 171 (1941), pp. 177-179, figs. 3*).—Brief comments are presented on studies of lettuce and cantaloup breeding, irrigation requirements of lettuce, and trials of berries such as Texas Wonder, boysenberries, and Macatawa.

[Horticultural studies by the Hawaii Station] (*Hawaii Sta. Rpt. 1940, pp. 15-17, 35-37, 46-47, 50-57, 77-79, 89-91, figs. 8*).—Among investigations reported upon are the improvement of U. S. D. A. 34 sweet corn by selection, and fertilizer requirements of sweet corn, both by E. M. Hodges and M. Takahashi; fertilizers for coffee trees, and the value of leaf analyses as indicators of the fertilizer needs of the coffee tree, both by L. A. Dean, E. T. Fukunaga, and J. H. Beaumont; testing of vegetable varieties, by D. Sumida and Tachibana; variety, propagation, pruning, and pollination trials with the macadamia nut, by P. L. Guest, Minn, and M. E. Hartung; physical properties of macadamia oil, by W. W. Jones; genetics of sex determination in the papaya, by W. B. Storey; variety tests of mangoes, by D. T. Fleming and Guest; effect of relative humidity on respiration of the papaya, by Jones; effect of vapor heat treatment on catalase activity in the papaya, by W. Ikeda and Jones; vapor heat treatment of various fruits and vegetables, and methyl bromide fumigation of papaya fruits, both by Jones; use of colchicine in the production of polyploid forms of various plants, by Hartung; plant introduction activities; movement of organic solutes in the sausage tree, by H. F. Clements; and the translocation of organic materials in *Cucurbita pepo*, by B. Cooil. At the Haleakala Substation adaptability tests were conducted with youngberries, boysenberries, and strawberries by F. T. Murphy.

[Horticultural studies by the Iowa Station]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940, pt. 1, pp. 150-151, 188-190, 203-220, 221, 223-224, 225-226, 228, 229, figs. 5*).—Among studies the progress of which is discussed are those by J. E. Sass, E. W. Lindstrom, E. C. Volz, B. S. Pickett, T. J. Maney, H. L. Lantz, H. H. Plagge, E. S. Haber, and E. T. Erwin on time and manner of flower bud formation in bulbous ornamental plants; inheritance of fruit size and shape in tomatoes; testing of ornamental plants for heat resistance and use in cut flower production; response of greenhouse plants to the principal soil types of Iowa; methods of growing uniform stocks and development of new stocks, particularly dwarfing stocks for the apple; systems of soil management for apple orchards; apple, pear, plum, and peach breeding; old v. new apple varieties; breeding of anthracnose resistant black raspberries; adaptation of strawberry varieties to southeastern Iowa; varietal, cultural, and fertilizer studies with strawberries on Muscatine Island; stock and scion relations in the apple; breeding and testing of rose stocks; effect of plant growth-promoting substances on the rooting of cuttings; freezing preservation of fruits and vegetables; effects of modification of storage atmosphere on the physiological and storage responses of apples and grapes; asparagus culture; fertilization of muskmelon; testing of wilt-resistant watermelons on infested soils; testing of varieties of sweet corn and tomatoes; a comparison of direct-seeded with southern and home-grown tomato plants; testing of muskmelon varieties; improvement in type and quality of canning pumpkins; and onion breeding.

[Horticultural studies by the Maryland Station] (*Maryland Sta. Rpt. 1940, pp. 23, 40, 53-55, 56-66, figs. 7*).—The studies discussed include sweet corn seed production and breeding; cytogenetics of the genera *Gladiolus* and *Tulipa*; the economics of peach planting distances; factors affecting maturity, shipping, and storage quality of apples; adaptation of fruit varieties and new seedlings; mulch-

ing and nutrient requirements of the blueberry; propagation of apple rootstocks; grading of peas; variety and strain tests of peas; fertilizer placement for the pea; value of organic matter in the production of vegetable crops; breeding lima beans; effect of certain environmental factors on the growth and fruiting of the tomato; breeding better-quality and disease-resistant cantaloups; spraying and dusting of cantaloups and tomatoes; and the testing of lima beans for canning and freezing purposes.

[Horticultural studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1940*, pp. 31-32, 62-66, 69-72, 77-79, fig. 1).—Among studies, the progress of which is noted, are phenological investigations with fruits and nuts, variety trials with apples, peaches, plums, and tomatoes, resistance of tomato varieties to western yellow blight, tests of chili and paprika varieties, culture of head lettuce in cold-frames, time of planting head lettuce, testing of pecan and grape varieties, testing of ornamentals including lawngrasses, testing of small fruits, the production of vegetable seeds, nature and control of biennial bearing in the apple, and onion variety tests and the improvement and irrigation of the White Grano onion.

Temperature in relation to vegetative and reproductive development in plants, H. C. THOMPSON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 672-679).—This brief summation of knowledge upon the subject is based on the work of many different investigators, including the author.

New method of treating cuttings, N. W. BUTTERFIELD and J. A. MCCLINTOCK. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1077-1079).—Employing a new technic in which cuttings were supplied indolebutyric acid solutions under vacuum, it was found that the vacuum treatment resulted in a material increase in the intake of solution, and as determined by the dye there was a greater absorption. In willow cuttings the vacuum-treated lot showed a more extensive distribution of roots along the stem and greater proliferation, and the cuttings rooted in less time. The advantage in the case of softwood cuttings was chiefly that of timesaving as they could be set in the bench within 2 hr. after they were taken from the plants.

The crow-bar method of applying soil correctives, plant nutrients, and disease inhibiting chemicals about the roots of horticultural plants, W. H. FRIEND. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1080-1083).—In experiments with grapefruit trees affected with a severe type of chlorosis treatment with activated sewage sludge and sulfur placed in holes punched about 2 ft. from the crown restored the trees to a healthy condition. Deep placement of superphosphate around strawberry plants was highly effective in promoting vigorous growth. Papaya trees subjected to root rot were protected by hole treatments with activated sludge and sulfur. Good results were secured with tomatoes, where the nutrients were placed by the hole method.

Possibilities and limitations of growing plants without soil outlined, F. B. WANN (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 1, pp. 6, 8, fig. 1).—Describing the technic of growing plants in solution cultures, the author suggests that this type of production is economically practical only in the production of high-priced crops under glass. Neither yield nor quality was essentially different from soil culture and the successful operation of the tanks and solutions required considerable technical training and experience.

Analyses of materials sold as insecticides and fungicides during 1940, C. S. CATHCART and R. L. WILLIS (*New Jersey Stat. Bul.* 686 (1940), pp. 16).—The usual tabulated data (E. S. R., 83, p. 193) are presented on the results of analyses of materials collected during the official inspection of 1940.

Newly developed vegetable varieties for use in California, D. R. POSTER, H. A. JONES, and G. N. DAVIS. (Coop. U. S. D. A.). (*California Sta. Bul.* 646

(1941), pp. 26, figs. 16).—Descriptive accounts are presented on a number of muskmelon, watermelon, onion, and tomato varieties developed individually or jointly by the station and the U. S. Department of Agriculture. The three muskmelons, Powdery-Mildew-Resistant Cantaloupe No. 45, Powdery-Mildew-Resistant Honeydew No. 60, and Baby Persian, are all resistant to form 1 of powdery mildew. Of the five watermelons, Klondike R7 and Blue Ribbon are resistant to *Fusarium* wilt, and the other three, California Klondike No. 3 and No. 8 and Striped Klondike No. 11, are susceptible. The Cal 55 tomato is a late-maturing, productive canning variety, and Pearson is adapted primarily for shipping and fresh market uses. Of the seven onions described, Lord Howe Island and Crystal Grano are extra-early types. Red 21 and Stockton G36 are adapted for the intermediate crop. Brown 5, similar to Australian Brown, is a desirable storage onion. Spanish 2, resistant to pink root, is a promising variety of the Sweet Spanish type. White Persian is promising as a parent for breeding onions resistant to thrips. The developing agencies followed the policy of turning over seed to commercial companies for increase and distribution.

Best vegetable varieties for Utah conditions recommended, L. H. POLLARD (*Farm and Home Sci. [Utah Sta.], 2 (1941), No. 1, pp. 1, 12*).—A list of varieties is presented on the basis of station trials.

Variety and time of planting as related to lima bean production in central Washington, W. J. CLORF. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 747-751*).—Having noted in 1938 that later plantings resulted in a larger number of blossoms setting pods at one time, the author planted several varieties in 1939 at different dates. All plants on each plot were pulled at one time and passed through a vincer. Henderson Bush was the earliest variety in all four plantings. All varieties planted July 1 with the exception of Henderson Bush were immature at harvest because of a killing frost on October 25. Baby Fordhook yielded at the rate of 2,000 lb. or more per acre of shelled green beans when planted June 1, 16, or 23.

Sweet corn breeding (Iowa Sta. Rpt. 1940, pt. 2, pp. 34-35).—Information is presented on sweet corn improvement by E. S. Haber through selfing and combination of resulting inbreds. Crossing between dent corn and sweet corn inbreds, followed by backcrossing to the sweet corn parent, gave desirable stalk characters but inadequate quality. Crosses were made also between sweet corn and waxy endosperm maize and between sweet corn and flint corn. The yields of Iowa sweet corn hybrids are compared with other well-known hybrids.

Value of bacterial inoculation of peas in Utah discussed, D. W. THORNE (*Farm and Home Sci. [Utah Sta.], 2 (1941), No. 1, p. 11, fig. 1*).—Discussing the principles and practices of seed inoculation, the author states that in the few tests carried out in various parts of Utah the results have been inconclusive. Since the observations were largely casual it is planned to conduct carefully designed studies with and without supplemental fertilizer treatments.

Relationship between tenderometer readings and alcohol insoluble solids of Alaska peas, E. P. WALLS and W. B. KEMP. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 729-730, fig. 1*).—A total of 361 samples of Alaska peas collected as they were in preparation for canning were tested with a tenderometer and the readings were compared later with data on alcohol-insoluble solids of the canned peas. Peas of large sieve sizes showed high percentages of alcohol-insoluble solids as compared with smaller peas, even of the same lot. A second-degree curve was required to describe the association between tenderometer readings and the percentages of alcohol-insoluble solids. The correlation index 0.96 showed the usefulness of the instrument in predicting the grade of canned peas.

Effect of environmental factors on the transpiration and growth of tomato plants, A. C. FOSTER and E. C. TATMAN. (U. S. D. A.). (Jour. Agr. Res. [U. S.], 61 (1940), No. 10, pp. 697-720, figs. 10).—"In this paper extensive data are submitted that show differences in the daily amount of transpiration of tomato plants (*Lycopersicon esculentum* Mill.) when grown in the greenhouse in soil with 4 nutrient treatments under 9 sets of environmental conditions involving 3 variations in soil moisture and 3 in air temperature, giving altogether 36 points of observation for study. Evaporation capacities of the air under the three conditions of temperature were measured. With increasing amounts of soil moisture and decreasing temperature, there was a corresponding increase in the rate of plant growth that was directly correlated with the early exhaustion of soil nutrients in the unfertilized cultures—a condition which was further reflected by a definite, measurable decline in the transpiration of the unfertilized plants. This decline in transpiration was relatively large at high soil-moisture levels. Data treated statistically by the method of analysis of variance indicate the highly significant effects of soil moisture, soil nutrients, and temperature on total water transpired, on the water requirement, on the fruit yield, and on the starch content of stem and leaf parts of tomato plants. Temperature and soil moisture, but not soil nutrients, had a highly significant effect on the final dry weight of the plants, all of which were topped uniformly after the appearance of the sixth flower cluster and pruned for removal of all axillary growth."

Effect of certain fungicides and environmental factors on the rate of transpiration of tomato plants, A. C. FOSTER and E. C. TATMAN. (U. S. D. A.). (Jour. Agr. Res. [U. S.], 61 (1940), No. 10, pp. 721-735, figs. 2).—"In this report data are presented that show the effect of copper phosphate-bentonite-lime, zinc-lime, and bordeaux mixture on the rate of transpiration of large, fruiting tomato plants (*Lycopersicon esculentum* Mill.). Extensive data are also presented which show the lack of interaction of these fungicides under widely different environmental conditions on the rate of transpiration of tomato plants, and indicate that environment does not influence the effect of the spray mixtures on the transpiration. Copper phosphate-bentonite-lime, applied as a fungicide, caused a significant increase in the rate of transpiration of mature tomato plants. Zinc-lime and bordeaux mixture had no significant effect on the rate of transpiration under the experimental conditions reported. Added increments of soil nitrogen, reduced soil moisture, and reduced air temperature all caused a marked reduction in rate of transpiration."

Relation of soil pore space to growth and yield of tomatoes, J. F. HARRINGTON. (Ohio State Univ.). (Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 919-922).—"In comparing six treatments including the incorporation of manure, cinders, and corn stover in different ways with fertile top soil as a control, it was found that cinder treatments gave significantly more pore space than the other treatments and, in general, the yields were correlated positively with pore space. In the spring crop the early growth was at first more rapid in the cinder plats, but supplemental N was needed to maintain satisfactory growth in both cinder and corn stover plats. With N supplied, the highest yields were secured from the cinder plats. In the succeeding fall crop, yield differences were not significant. It was evident that pore space and organic matter were affecting yields, and that other factors, such as water-holding capacity, may have been concerned."

Increasing tomato yields, C. B. SAYRE (New York State Sta. Cir. 191 (1941), pp. 8, figs. 2).—"Information is presented on cultural practices, that would permit or aid in increasing tomato production, such as the growing of plants, methods

of transplanting, use of starter solutions, general fertilization, direct seeding, and control of cutworms.

The home fruit garden on the northern Great Plains, W. P. BAIRD (*U. S. Dept. Agr., Farmers' Bul. 1522, rev. (1940), pp. [2]+54, figs. 43*).—This revised edition (E. S. R., 56, p. 740) includes general information on the establishment and maintenance of fruit plantings, with special attention to new varieties which have been introduced or developed since the original publication was issued.

Bloom period and yield of apples, C. W. ELLENWOOD (*Ohio Sta. Bul. 618 (1941), pp. [1]+21, figs. 2*).—Blooming and harvesting dates, yield records, and other pertinent information are presented for 146 varieties of apples growing in the station orchards. The average date of full bloom for standard varieties over the 30 yr. ended 1939 was May 7. In years when full bloom was reached before May 1 there was frost injury. Low temperatures in March and April were associated with high yields. The average length of the blooming season for a large number of varieties over the period 1930-39 was 8 days. The average annual yield per tree of 61 varieties for the 30 yr. was 13.8 bu.

Anjou pear responses to irrigation in a clay adobe soil. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 374 (1940), pp. 103, figs. 27*).—This paper, presented in two parts—I, Tree Responses, by W. W. Aldrich, M. R. Lewis, and R. A. Work, and II, Fruit Quality, by A. L. Ryall and F. C. Reimer—summarizes the results of irrigation studies in the Rogue River Valley. It was evident that, under the prevailing heavy soil and climatic conditions, whenever a reasonably large number of fruits had set larger fruits were produced by maintaining the soil moisture high in the available range throughout the season, particularly in the late season. A definite tendency noted under heavy soil irrigation toward a smaller percentage set approximately balanced the larger total number of blooms resulting from the increased growth. There was no evidence of injury to trees from maintaining high soil moisture throughout six consecutive growing seasons. On the average, over the 6 yr. 14 in. of water in three or four applications in the latter part of the growing season produced within one-half box per tree as much fruit as did 21 in. in six or seven applications. The best-flavored pears were grown on those trees which suffered for water during the last month or so before picking. After 6 mo. in storage, pears from trees subjected to drought showed more break-down and considerably less scald. Economic factors, such as price of different sizes of pears and relation of cost of added irrigation, are said to be important in determining the most profitable practice.

Pruning mature Kieffer pear trees, S. JOHNSTON (*Michigan Sta. Quart. Bul., 23 (1941), No. 3, pp. 168-172, fig. 1*).—Stating that the Kieffer pear tends toward biennial production with heavy crops of small-sized fruits, the author discusses an experiment in the pruning of 35-year-old trees in excellent condition. Of three types of pruning used, the results indicated that moderate heading was the best treatment from the standpoint of stimulating annual fruiting and of income derived from the crop. Severe heading resulted in drastic reduction in total yield and income. It is suggested that pruning and cultural practices with the Kieffer pear be regulated so that the terminal growth will not exceed 12-14 in. in length so as to minimize injury from the fire blight organism.

Food storage in the peach tree in relation to nitrogen fertilization, C. F. WILLIAMS (*North Carolina Sta. Tech. Bul. 67 (1941), pp. 19, figs. 5*).—Analyses of succulent young shoots collected several times throughout the year showed a high percentage content of total N in April, followed by a rapid decrease

during shoot elongation and reaching a minimum in midsummer. There was an increase in late summer and autumn, the amount of which was related to the available N in the soil. It was evident that as much available N is needed in the soil in late summer to raise the N to a desired level as is needed in the spring to maintain satisfactory new growth. Trees fertilized with nitrates following harvest made greater spring shoot growth than those not so treated. Neither the date of bloom nor the period during which length growth occurred was affected. Irrespective of N treatments, the trees tended to arrive at similar low levels of N concentration during shoot elongation, indicating that the available N was all utilized in growth. The author suggests that on light, sandy soils some provision should be made for supplying N during summer and fall. There was no indication of late-continued or second growth from late-summer applications of N, and such treatments proved beneficial by delaying the onset and thus prolonging dormancy. No winter injury was observed during the 5 yr. of the experiment.

Carbohydrate determinations showed the same trends for reducing and non-reducing sugars, i. e., relatively high in the succulent spring growth, decreasing in percentage content in midsummer, increasing during fall, and remaining high through the dormant period. The seasonal changes in percentage starch showed an opposite trend. Acid-hydrolyzable materials in the shoots increased during the growing season until they constituted from 19 to 20 percent of the dry matter by August. There was a small decrease during dormancy. Total carbohydrates increased continuously during summer and early fall while the foliage was functional. There was a small percentage decrease during dormancy.

Variations in the time or rate of N fertilization had little effect on the percentage amounts of reducing or nonreducing sugars. N had a very direct influence on the quantity and quality of foliage and thereby affected carbohydrate synthesis, suggesting the need of a continuously available supply of N for effective carbohydrate accumulation.

Growth substance in rooting certain *Prunus* species, L. E. LONGLEY. (Univ. Minn.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1091-1092).—Observations on the rooting response of greenwood cuttings of several species of *Prunus* when treated with certain proprietary growth substances showed distinct benefits in some cases and none in others. *P. nana* did not respond to treatments. *P. triloba* responded definitely to one substance and not to another. *P. japonica* cuttings responded to both materials. The results indicated the desirability of using growth substances to hasten and increase rooting in species that are favorably influenced.

Fruiting habits of sour cherries and orchard practices, H. B. TUKEY (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 5, 11, figs. 3).—Discussing the fruiting habits of sour cherries, the author points out that a lack of fruitfulness in the Mountmorency variety may be due largely to a lack of spurs forming on the prevailing short shoots of poorly nourished trees. In trees forming shoots 6 in. or more in length, leaf buds develop into spurs or strong laterals which increase the fruiting surface. The blossom buds formed on spurs are apparently harder than those on 1-yr. terminal wood. In the English Morello there is a tendency for young wood to produce strong lateral growths instead of spurs. These laterals tend to fruit terminally, leaving longer barren areas. Where strong growth was encouraged by fertilizing and pruning, the shoots formed both spurs and laterals. In both varieties cultural practices which promoted vigor tended to result in higher yields.

Strawberry culture.—Eastern United States, G. M. DABROW (*U. S. Dept. Agr., Farmers' Bul.* 1028, rev. (1941), pp. [2]+43, figs. 22).—This is a revision

of the earlier-noted edition (E. S. R., 40, p. 838) and in a like manner contains comprehensive directions for planting, fertilizing, cultivating, harvesting, and marketing strawberries.

Precooling of strawberries. H. T. BARR and W. D. POOLE (*Louisiana Sta. Bul.* 331 (1941), pp. 21+[1], figs. 7).—Prompted by the rapid development of precooling, studies were made in 1938-40 on rates of cooling and the effects of precooling on the condition of berries when reaching their destination. The use of thermocouples placed during the loading permitted readings in various parts of the cars. Picking berries during or immediately after rains predisposed the fruit to decay in transit. Dry ice was used experimentally in 2 yr., and it was found that its addition to the ordinary water ice permitted cars to travel without the usual re-icing in transit. In one case the car with dry ice plus ordinary ice arrived at market with a lower temperature and with the berries in better condition than those in the car with water ice alone. Shipments in refrigerated trucks gave generally good results if the fruit was pre-cooled before the start of the journey. A direct expansion refrigeration system was used in some of the trucks, and in others cooling was provided by the use of pumps and fans circulating cold air over ice and salt. Trucks permitted a more flexible and wider distribution than was possible with express cars alone. The principles of refrigeration and the types of equipment are described in detail.

Some observations on blueberry nutrition based on greenhouse culture. A. E. STENE. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 620-622).—Blueberry plants grown in 12-in. pots and supplied with nutrient solutions so as to maintain pH reactions of approximately 7.0, 5.2, and 4.0 made new growth in the order of 219, 78, and 138 in. In another trial in which plants were grown at 3.5, 4.0, 5.2, and 6.0 pH the best growth was obtained with a complete nutrient solution held at pH 6.0. That the type of organic matter added is a potent factor in blueberry growth was shown in another experiment where the growth was nearly twice as great in the section of the bed containing sand and oak leaf mold as in the section containing sand and soil. The effect of pH varied apparently with the type of fertilizer used. The author suggests that the blueberry may thrive under certain conditions under a rather wide pH range, and that pH may influence blueberry growth not necessarily by itself but by an effect on the release or absorption of certain nutrients such as K. N was indicated as an important element in the maintenance of vigorous growth.

Weed control in the cranberry bogs of western Washington. D. J. CROWLEY. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 623-624).—Whereas in the early life of a bog weeds may be removed by hand, there comes a time when other means are necessary. In 1936 gasoline applied to horsetails as they first appeared above ground showed considerable merit. In 1939 western petroleum paint thinners and solvents killed 95 percent of the horsetails with little injury to the cranberries, except in one instance where a period of cloudy damp weather followed the application. It is suggested that the solvents penetrate the horsetail tissues quickly and evaporate from the more woody cranberry vines before injury occurs. Loosestrife also proved very sensitive to the solvents and thinners.

What new grape varieties are doing: Survey of growers. R. WELLINGTON and H. O. BENNETT (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 3, 9, 15).—Discussing the difficulties involved in testing the new varieties of fruits, the authors present information on six grape varieties, namely, Golden Muscat, Fredonia, Sheridan, Keuka, Portland, and Ontario, all developed by the station.

Present status of grape trials in western Oregon, W. P. DUBUZ. (Oreg. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 655-660).—Observations on some 150 varieties of grapes growing at Corvallis showed that pure vinifera varieties are not in general well adapted to the locality. The greatest promise appeared to be with hybrids of vinifera and labrusca or with pure labrusca types. On the assumption that a seasonal total of 2,500° F. above 50° is needed for the proper ripening of vinifera grapes this total was reached but once in a period of 5 yr., and the records over 41 yr. showed an average of 1,806°. Seneca, Golden Muscat, Keuka, and Sheridan were found self-fruitful.

The "T" bud method, an aid to grape propagation, F. N. HARMON and E. SNYDER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 663-665, fig. 1).—Observing that the T-bud method of propagation was of value in hastening production of fruit in seedlings, the authors used the procedure successfully in establishing vinifera varieties on resistant rootstocks. T-budding extended the propagation season, and under conditions at Fresno, Calif., gave sufficient growth from the earlier buds to produce fruit the following season. During very warm days late afternoon budding gave better results than morning budding. Wrapping the buds with rubber tying material and shading them until growth started increased the success.

Note on grape foliation as affected by time of pruning, N. H. LOOMIS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 653-654).—Observations at Meridian, Miss., on the spring growth of Extra grapevines pruned at different dates during the dormant season showed that delayed pruning retarded foliation to a significant degree. Delayed foliation also delayed blooming but had no apparent effect on the time of ripening or upon the total growth of the year. The degree of the effect of delayed pruning was not the same for all 3 yr. of the experiment and could not be correlated with low winter temperatures.

A preliminary report on the effect of cluster thinning on the maturity, yield, and cluster size of grapes, C. H. RAGLAND. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 661-662).—The removal at the time of bloom of all except one cluster per shoot from Concord vines resulted in a reduction in total yield of about 25 percent as compared with unthinned vines. However, thinning tended toward uniform ripening of the berries, increased the size of clusters, and hastened maturity in proportion to its severity. In Campbell Early severe thinning reduced total yields even more than in the Concord and had less benefit on cluster size. Thinning of Delaware grapes proved of great importance despite sharply decreased total yields in that the percentage of well-ripened fruit was greatly increased.

Leaf-bud cuttings for multiplying tropical shrubs, J. V. WATKINS and G. H. BLACKMON. (Univ. Fla. and Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1109-1111).—Tropical and semitropical ornamentals representing 15 genera responded very favorably to the leaf-bud method of propagation. Treatment of cuttings with indolebutyric acid in talc formed heavy root systems more rapidly than did the controls. It is suggested that growth substances may have their greatest use in Florida nurseries that are working up large stocks of specialized plant materials from limited amounts of original material.

The effect of synthetic growth substances on the rooting of subtropical fruit plants, W. C. COOPER and K. R. KNOWLTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1093-1098, figs. 2).—Cuttings of 16 different varieties of *Citrus*, including grapefruit and sweet and sour oranges, were rooted successfully by treating the basal ends with aqueous solutions of indoleacetic acid. The treated cuttings not only were more successful but had

a greater number of roots per cutting than the controls. Favorable results were obtained also with various fruits such as lychee, papaya, sapodilla, guava, and mountain persimmon. Dusts containing naphthalenecetic acid were effective in rooting cuttings of such fruits as lime, lemon, papaya, etc., but had no effect on grapefruit, mandarin, sour and sweet oranges, and lychee.

Grapefruit storage studies in Arizona. W. E. MARTIN, R. H. HILGEMAN, and J. G. SMITH. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 529-534, figs. 3).—Fruit harvested from selected trees at monthly intervals from December to May was stored at 60° F. and a relative humidity of 88 percent. Judged at monthly intervals by flavor, softness, appearance, and behavior, all fruit picked between late December and late March kept satisfactorily for at least 3 mo. Later pickings did not keep so long. Mineral analyses failed to connect storability with P, Ca, Na, K, or N contents. Waxing was of material benefit in the retention of color and flavor and in decreasing shrinkage. Storage for 1 mo. enhanced flavor, but at the end of 3 mo. some fruits had developed off-flavors. Changes in total soluble solids and citric acid in spring-harvested fruits were particularly evident in crops grown on lighter soil types.

Variability of sugar-acid ratio and total nitrogen in Valencia oranges. D. APPLEMAN and A. V. RICHARDS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 539-542).—Studies of 10 fruit samples taken from 10 5-year-old Valencia orange trees on sweet orange roots all grown from the seed of a single parent tree showed that differences that have a chance of being detected in 90 out of 100 cases were found for Brix, percentage citric acid, Brix-percentage citric acid ratio, and percentage of nitrogen in the dry rind. It was evident that in a sample of 10 fruits a difference of 0.952 has a chance of being detected in 9 out of 10 cases. However, if the sample with the smallest standard deviation from Brix, 0.3, was considered, then with a sample of 20 fruits one could expect to detect a true difference of only 2.8 percent. It was indicated that a sample of 10 fruits is inadequate and that from 20 to 30 are needed to give fair representation.

Inducing flowering in the pineapple, *Ananas sativus*. H. P. TRAUB, W. C. COOPER, and P. C. REEVE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 521-525).—The fact that the main crop of Florida pineapples matures in June and July in competition with the Cuban and Puerto Rican crops led to a study of means of inducing the Florida crop to come into fruiting at an earlier season. Plants treated with ethylene changed from a vegetative to a flowering condition in a relatively short time. Microscopic studies showed a perceptible change within 6 days, and by the twentieth to twenty-sixth day the first rows of flowers were forming. It is suggested that ethylene may in itself be a hormone, or that it may act on the mature leaves to cause a release of a flower-forming substance that migrates to the apical meristem and sets in motion a series of events that lead to flowering.

Male sterility in *Castanea*. J. W. MCKAY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 509-510).—An examination of young male flowers taken from a large seedling tree of *C. crenata* which had been found completely male-sterile during 3 seasons showed that stamen primordia had not formed. Another type of male sterility was observed in which male flowers failed to open and microscopic examination showed that the stamens had failed to develop. In still another male-sterile tree the staminate flowers dropped before the pistillate flowers opened.

Some blossoming relationships found in a study of the dichogamy of pecan varieties. F. N. DODGE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 503-508, fig. 1).—Observations over a period of years on some 26

varieties of pecans growing at Robson, La., indicated that there is a regularity in the order in which the varieties initiate different stages of growth and blossoming each year. Nelson was the first variety to liberate pollen in each of four successive seasons. Both the first appearance of pistillate flowers and the drying of the stigma followed a definite order. The type of dichogamy was influenced by the season, with a greater tendency toward protandry in early seasons and toward protogyny in late seasons. It is suggested that it might be well to provide two pollinizer varieties, one for early and one for late seasons.

A statistical study of variation in tung fruits, G. F. POTTER, E. ANGELO, J. H. PAINTER, and R. T. BROWN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 515-517).—Stating that the tung industry is at present based on seedling trees which vary greatly in growth and productivity, the authors conducted an investigation to determine how many fruits should be taken from an individual tree to give an adequate sample. Four measurements were used, namely, transverse diameter, weight, percentage of filling, and proportion of kernel to fruit. Trees differed greatly in the variability of these characters. It is concluded that a 25-nut sample is most practical for preliminary studies, since a smaller sample would often be inadequate and a larger one would greatly increase the task.

The error of sampling in studying distribution of the root systems of tung trees by means of the Veihmeyer soil tube, E. ANGELO and G. F. POTTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 518-520).—Determinations of the average weight of roots in a cubic foot of soil 3 ft. from the trunk of each of 25 7-year-old trees were made by two methods, (1) taking four samples with a tube, and (2) digging up the cubic foot of soil and extracting the roots. Using roots of 2 mm. or less in diameter the tubes indicated a total of 892 gm. of roots in the 25 cu. ft. of soil, whereas there were actually 856 gm. The standard error of the mean of the 100-tube samples was approximately 5.3 percent. The number of unit areas in which root concentration would have to be determined depends on the type of soil and the size of tree. The presence of a compact layer near the surface might preclude root growth at certain levels.

Effect of different methods of girdling tung branches, J. H. PAINTER and R. T. BROWN. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 511-514).—Stating that girdling is a necessary procedure in certain studies such as the relation of leaf area to the degree of filling and oil content of nuts, the authors discuss the results of a study at Cairo, Ga., in which limbs were girdled July 13, August 13, and September 8 in different manners. Part of the wounds were covered with grafting wax. Using increase in diameter as an index to the success of girdling, the greatest swelling above the wounds occurred when a strip of bark was removed and no wax applied. Waxing promoted healing and is believed necessary to insure the survival of the treated branches. The results indicated that the tung tree may be girdled effectively by any one of several methods, but apparently the best is to remove a ring of bark. It was evident that girdling should not be done later than the middle of August.

The response of plants to intermittent supplementary light, E. P. HUMM (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1059-1065, fig. 1).—From the results of studies with numerous flowering plants, including larkspur, stock, China-asters, and chrysanthemums, it was evident that intermittent light was frequently more effective in stimulating blooming than was continuous light over the same period. With larkspur the earliest flowering occurred in the plats receiving 50 percent light on the longest cycle. This plat began

flowering 11 days ahead of the continuously lighted plat. Annual chrysanthemums responded as well to flashing light which was on 50 percent or more of the time as to continuous light, and intermittent light produced longer stems in all treatments. With fall-blooming chrysanthemums, plants receiving light one-third or more of the cycle flowered at about the same time as the continuously lighted plants.

The response of *Daphne cneorum* to various fertilizers and soil treatments and to soil from different sources, J. A. DEFRAANCE and A. E. STENE. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1066-1072).—That *D. cneorum* has a low fertility requirement was shown in the fact that the plants receiving no fertilizer or lime were the best in the experiment. Where manure was incorporated at the rate of from one-third to two-thirds of soil a large percentage of the plants died. The detrimental effects of manure persisted for at least 2 yr. after application. Leaf mold was of no apparent benefit and peat only during the dry season. Of minerals, lime was apparently of no value and P or K did more harm than good. Nitrogen was of slight benefit. Apparently rose daphne has rather characteristic soil preferences. Pruning was beneficial in increasing the number of flowers the following year.

Paperwhite narcissus, R. D. DICKER (*Florida Sta. Bul.* 353 (1940), pp. 24, figs. 8).—The author discusses the rapid development of the bulb-growing industry in Florida, and states that the Paperwhite narcissus is the principal variety grown and that round, firm, single-nosed bulbs 12 cm. or above in circumference are desired by the trade. When slabs were graded into sizes from 4 to 15 cm. it was found that some of each size developed into round bulbs. Since more round bulbs were formed from the larger slabs it is suggested that the smaller ones be discarded. With round bulbs from 6 to 16 cm. in size there was a tendency as the size increased for an increasing percentage to split into mother bulbs. A certain percentage of mother or split bulbs tended to round up, especially in the smaller sizes.

As to the effect of size of planting stock upon production of marketable bulbs, the results indicated that all categories of bulbs 8 cm. or below should be discarded. Bulb size was one of the most important factors influencing flower production, and the percentage of bulbs flowering in each type was directly associated with size. There was, however, a distinct difference in the responses of the different types of bulbs.

Progress report on soil and fertilization studies with outdoor roses, D. C. KIPLINGER and L. C. CHADWICK. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 978-982).—Records taken over a 3-yr. period on flower production of five varieties of roses grown in Fox silt loam maintained at different pH levels supplied with peat or various minor elements showed zinc, magnesium, and manganese treatments to be consistently among the first 5 of the entire 10. The effects of pH levels were less apparent and were inconsistent. In a trial of various soil mixtures it was apparent that amendments of peat in the proportion of one part of peat to one of soil were effective, giving even larger yields than a half-and-half mixture of soil and rotted cow manure. Shredded tobacco leaves were distinctly harmful. In general, as the percentage moisture in the soil medium rose above 20 percent, production and general appearance were good at the end of the season.

The maintenance of effective nutrient levels for the soilless culture of roses, O. W. DAVIDSON. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 993-997).—In a greenhouse study with Happy Days roses on Manetti roots grown in nutrient solutions it was found that effective levels could be maintained over a period of at least 8-10 weeks by the application of small

amounts of ammonium nitrogen, phosphorus, and potassium. The conclusions are based on the use of 500 gal. of solution for each 150 to 250 plants. The author believes that by moderate periodic applications of nutrient salts or alkalies the effectiveness of nutrient solutions may be maintained for several months.

The removal of leaves from rose plants at the time of digging, J. A. MILBRATH, E. HANSEN, and H. HARTMAN (*Oregon Sta. Bul.* 385 (1940), pp. 11, figs. 2).—In this further contribution (E. S. R., 83, p. 64), the authors discuss the purposes of leaf removal, methods generally used, and a new procedure involving the use of ethylene gas. In tests over a 3-yr. period with various concentrations of gas there was no evidence of harmful aftereffects on the plants. Ethylene was most effective between 70° and 75° F., and it was found necessary to keep the plants wet during treatments. The practical application of the method is outlined.

Culture, diseases, and pests of the box tree, F. WEISS and L. G. BAUMHOFER (*U. S. Dept. Agr., Farmers' Bul.* 1855 (1940), pp. [2]+18 figs. 9).—General information is presented on kinds of box, climatic adaptation, soil requirements, fertilization, cultural care, disease and insect pests, etc.

Synthetic growth substances as aids to root production and evergreen and softwood deciduous cuttings, J. SWARTLEY and L. C. CHADWICK. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1099-1104).—Growth-promoting substances incorporated with talc were found almost as effective as solutions and possessed the advantage of easier application and a wider range of effective and safe use. The value of growth-promoting substances for both narrow-leaved evergreens and softwood deciduous cuttings was demonstrated. Although growth substances in the free acid form were in general more effective than the amides, particularly with difficult plants, the amides showed promise in extending the present range of practical applications. In the case of two species the fineness of the talc and the method of mixing made little difference. Moistening the base of cuttings in water before dipping in powder was important.

Some physiological factors in growth and reproduction of trees, A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 666-671).—This is a brief review of the status of knowledge upon the subject, based on the results of researches by the author and other workers.

FORESTRY

[Forestry studies by the Iowa Station] (*Iowa Sta. Rpt.* 1940, pt. 1, pp. 185-188, fig. 1).—Studies mentioned include those carried on by G. B. MacDonald, C. M. Genux, B. B. Sproat, and A. L. McComb on the production of nursery trees for erosion control; volume growth and yield of Iowa timber trees; cultural practices in the forest-tree nursery; and the mineral nutrition of woody plants.

Tree growth beside a rain gauge and thermometer, C. J. LYON (*Ecology*, 21 (1940), No. 4, pp. 425-437, figs. 3).—Annual ring measurements of trees of six species, white pine, red oak, Austrian pine, Scotch pine, Norway spruce, and European larch, felled at Hanover, N. H., by the 1938 hurricane, were correlated with temperature and precipitation records taken at a nearby weather station. For the full length of their growth the white pine, red oak, and Scotch pine gave significant positive correlation coefficients with the rainfall of certain periods of the year, but the other three species showed no consistent agreement with precipitation when the growth increments of all years were considered. There

was little agreement between growth increments and temperatures of the growing season, but all the conifers showed significant positive correlations between growth of a single year and the temperatures of the preceding March and April. The effect was interpreted as indirect by determining the amount of water which the soil absorbed from melting snow and from precipitation in March and April. A delayed effect of April air temperatures on soil temperature in early March is thought likely. White pine was outstanding in its response to available soil moisture.

Intensive projects under the Cooperative Farm Forestry Act (U. S. Dept. Agr. Leaflet 208 (1941), pp. [1]+6, fig. 1).—Information is presented with regard to the nature, need, and administration of the farm forestry program conducted under the Cooperative Farm Forestry Act of 1937.

Forestry nursery supplies trees to farmers at very low cost, P. M. DUNN (Farm and Home Sci. [Utah Sta.], 2 (1941), No. 1, p. 2, fig. 1).—Discussing the operations of a cooperative nursery conducted at Logan under the provisions of the Clarke-McNary Act, the author states that 300,000 seedlings are available for distribution in 1941. The 5 species found best adapted for Utah were green ash, Russian olive, Siberian elm, eastern red cedar, and honey locust.

Restoring conifers to aspen lands in the Lake States, H. L. SHIRLEY (U. S. Dept. Agr., Tech. Bul. 763 (1941), pp. 36, figs. 13).—With poor-quality aspen, scrub forests, and brush occupying some 10 million acres of forest land in northern Minnesota, Wisconsin, and Michigan and giving little promise of producing marketable forest products other than fuel and posts for many years, there is a tremendous problem in restoring the area to more valuable species. Aspen, because of its light buoyant seeds, is one of the first species to invade cut-over and burned lands, and when once established is able to compete with better trees because of its very rapid growth and root-suckering habit. Although ultimately, in the absence of fire, aspen would probably be displaced by better trees, the process is necessarily very slow because of various factors such as paucity of mother seed trees, inability of conifer seed to germinate on forest litter, competition with shrubs and herbaceous vegetation, lack of adequate light beneath aspen, and feeding by deer, hares, etc. Evidence was obtained that dense aspen stands do not offer protection for young conifers but rather smother and suppress them. Included among measures necessary for restoring conifers on such land are the selection of desirable species; use of large, strong transplant stock; reduction of competition from overstory, undergrowth, and roots; elimination of fire; protection from animals; and selective weeding and liberation cuttings. The importance of exposing the mineral soil in seeding operations was evident, and the use of heavy machinery for uprooting aspen and brush stands is discussed. Data are presented on the probable costs and returns from restoring conifers, with evidence that the task would require public support.

The cycle from Douglas fir to hemlock, T. T. MUNGER. (U. S. D. A.). (Ecology, 21 (1940), No. 4, pp. 451-459, figs. 4).—Stating that Douglas fir is not the climax species, and that in the absence of fire or clear cutting western hemlock or other shade-tolerant species would ultimately supplant the Douglas fir, the author reports that as even-aged Douglas fir forests increase with age the proportion of Douglas fir diminishes and that of hemlock and other tolerant species increases. An Olympic Peninsula forest, free of fire for five centuries and which had primarily consisted largely of even-aged Douglas fir, was found to have only 5.8 living Douglas fir trees and 21.9 hemlocks per acre. A similar invasion of hemlock and other tolerant species was noted in younger Douglas fir stands.

In the southern part of the Douglas fir region, where ecological factors were less favorable for hemlock, cedar, and balsam firs, the Douglas fir to hemlock cycle did not prevail. Near the coast western hemlock and Sitka spruce dominated both old and young stands.

Commercial timbers of the United States, H. P. BROWN and A. J. PANSHIN (*New York and London: McGraw-Hill Book Co., 1940, pp. XXI+554, figs. [388]*).—This is a new book intended to replace *Identification of the Commercial Timbers of the United States* (E. S. R., 72, p. 57). It contains an exhaustive treatment of the structure, properties, and uses of wood, with specific information on a large number of species.

Methods of distinguishing between the shipmast and common forms of black locust on Long Island, N. Y., H. HOFF (*U. S. Dept. Agr., Tech. Bul. 742 (1941), pp. 24, figs. 18*).—Among promising forms of black locust is the shipmast locust, characterized by straight trunk, greater durability of the wood, greater resistance to the locust borer, and certain other desirable features. In the juvenile stage, the characters distinguishing the shipmast from the ordinary locust are the double-recurved ventral margin on the stipular spines and the ovate leaflets with emarginate apices and poorly developed stipules. However, since some common locust trees have spines and leaf characters like those mentioned, there is no absolute means of identifying the young shipmast trees. Distinction becomes more certain in the mature trees because of bark differences. Trees over 4 in. d. b. h. are distinguishable by the bark index, a compound numerical expression that differentiates the heavy, thick-ridged bark of the shipmast from the thinner bark of the common locust. The bark index is said to furnish an objective determination of even small differences in the bark. A simple linear nomograph is presented which distinguishes approximately 50 percent of the trees 6 in. d. b. h. and 99 percent of the trees 16 in. d. b. h. Other useful characters for identifying mature shipmast trees are the greenish-yellow calyxes with only a few red blotches, and the width of the sapwood and of the inner bark. The first character is classified according to a pigmentation scale, and the other two are described by formulas.

Frost heaving and damage to black locust seedlings, W. E. COOPER (U. S. D. A.). (*Ecology, 21 (1940), No. 4, pp. 501-504, fig. 1*).—Following the severe winter of 1935-36 observations were made in 10 plantations in northern Alabama. Protection to seedlings against frost heaving was in direct proportion to ground cover. Frost heaving was in inverse proportion to seedling size, affecting about one-half the smaller and one-third of the larger plants. Heaving was about the same in winter and spring planted lots, leading to the inference that heaving is not cumulative. In approximately two weeks the plants were stabilized against further freezes, either by root growth, soil settling, or both. Mortality did not exceed over 5 percent and was determined by the percentage of plants which were heaved almost or completely out of the soil.

Slash disposal and forest management after clear cutting in the Douglas fir region, T. T. MUNGER and D. N. MATTHEWS (*U. S. Dept. Agr. Cir. 586 (1941), pp. 56, figs. 16*).—The quantity of debris left on the ground after clear-cutting in this region constitutes a tremendous fire hazard, making slash disposal of great importance as a fire-protection measure. Broadcast burning, the only practicable method of disposal, has only one real advantage, namely, the removal of some of the immediate fire hazard, and has several disadvantages, such as lessening the chances for adequate natural reforestation and the impairing of the quality of the surface soil. The technic of burning slashings is discussed, and it is pointed out that whereas the fire hazard is much less immediately following burning it increases gradually so that in approximately 20 yr. it is about

equal on burned and unburned areas providing no subsequent fires have occurred. The prompt restoration of a new forest cover is a desirable measure in again attaining a reasonable degree of natural protection by suppressing the undergrowth. Temporary grazing of logged-over land is not incompatible with timber production and may have some temporary benefit in decreasing the fire hazard.

Fire Control Notes, [April 1941] (U. S. Dept. Agr., Forest Serv., Fire Control Notes, 5 (1941), No. 2, pp. 11+61-122, figs. 9).—This is the usual quarterly issue on the technic of fire control.

Forest and watershed fires in Utah, E. O. BUHLER. (Coop. U. S. D. A.). (Utah Sta. Cir. 115 (1941), pp. [1]+27, figs. 18).—Stressing the important role of the mountain forests and vegetation in maintaining the vital water supply for the agricultural and urban communities in the valleys, the author discusses the extent of forest and watershed fires in Utah and the urgent need of fire prevention and better management practices. Among the serious aftereffects of fires are floods, erosion of the surface soil, damage to highways, and the destruction of wildlife. It is maintained that the most hazardous areas could be given adequate protection at relatively small cost, and the author outlines a plan of cooperation under Federal and State leadership that should provide adequate protection. The plan includes a watershed management service, production of timber on State lands, and the expansion of community forests.

Wood-using industries of Virginia, J. B. GRANTHAM (Va. Polytech. Inst. Bul., 34 (1940), No. 1, pp. 130, figs. 20).—Information is presented on species of wood used, wood products manufactured, location of industries, and the uses to which the various wood species are adapted.

DISEASES OF PLANTS

The Plant Disease Reporter, [April 1 and 15, 1941] (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 6, pp. 147-166, figs. 2; 7, pp. 167-212, fig. 1).—In addition to the host-parasite check-list revision, by F. Weiss (No. 6, *Elaeis* to *Eysenhardtia*, and No. 7, *Fagus* to *Franseria*), the following items are noted:

No. 6.—Relative prevalence and geographic distribution of various ear rot fungi in the 1940 corn crop, by P. E. Hoppe; incidence of bacterial wilt of sweet corn, 1935-1940—forecasts and performance, by N. E. Stevens and C. M. Haenseler; and tomato diseases in New Jersey in 1930 and 1940, by E. K. Vaughan.

No. 7.—Species of *Fusarium* associated with root rots of the Gramineae in the northern Great Plains, by W. L. Gordon and R. Sprague; early spring incidence of rusts of wheat and oats in Texas, by E. S. McFadden; diseases of shade and ornamental trees—annotated list of specimens received in 1940 at the New Haven office, Division of Forest Pathology, by A. M. Waterman; reports of cedar blight in 1940 and notes on its previous occurrence in nurseries, by G. G. Hahn; some parasitic and saprobic fungi of southern Ohio, by W. R. Cooke; on the longevity of the crown gall organism in soil, by E. M. Hildebrand; and brief notes on persistence of *Phytophthora blight* on seed of field corn, garlic rust infection of onion, *Botrytis* stem rot of tomato in a greenhouse in Maryland, white rust on Texas-grown spinach, downy mildew on tobacco in Georgia and South Carolina, and maturity of the apple scab fungus in Pennsylvania.

[Phytopathological studies by the Hawaii Station] (Hawaii Sta. Rpt. 1940, pp. 49-50, 67-74, 79, 80, figs. 5).—Brief reports by P. L. Guest, G. K. Parris, K. Kikuta, M. Matsuura, and H. G. Heggeness are included on studies of a chlorosis of macadamia; yellow spot of pineapple on tomato; virus disease and fruit and stem rot, and control of stem rot of papaya; leaf spot of Napier grass;

spraying and fertilization for control of early blight of potato; nematode effects on potato and their control; *Pythium* and *Rhizoctonia* damping-off; miscellaneous diseases in Hawaii; and arsenic toxicity to tomato plants.

[Phytopathological studies by the Iowa Station] (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1940, pts. 1, pp. 132-136, 138-141, 141-146, 149-150, 184-185, 194-195, fig. 1; 2, pp. 29-30, 35, 43-45, 48-54.*)—In part 1 brief reports of progress by S. G. Younkin, I. E. Melhus, H. C. Murphy, G. Semeniuk, G. C. Kent, J. N. Martin, C. S. Reddy, W. F. Buchholtz, A. L. Bakke, W. E. Loomis, E. L. Waldee, R. H. Porter, J. H. Standen, D. R. Shepherd, D. Lubberts, G. B. MacDonald, C. J. Drake, and J. W. Gowen are included on breeding and selection of better disease-resistant strains of watermelons and sugar beets; parasitism of the smuts, rusts, and minor diseases of oats; propagation of disease-free-sweetpotato seed stock; yellow dwarf and other onion diseases in Iowa; apple blight and scab; influence of pythiaceae and other fungi on seedling stands of legumes and other crops; properties and herbicidal and fungicidal action of sodium chlorate mixtures; identification and control of diseases of small ornamentals and fruit tree stocks in Iowa nurseries; biology and control of nursery diseases of plants to be used in preventing soil erosion; diseases of potato seed stocks and their causal agents, and testing of new hybrids for resistance to tuber and soil-inhabiting parasites; control of black stem rust by eradication of the common barberry; control of white pine blister rust in Iowa; and X-ray irradiation effects on biological substances, including genes and viruses.

In part 2 progress reports by R. H. Porter, R. C. Eckhardt, G. F. Sprague, C. S. Reddy, I. E. Melhus, R. Wilkinson, G. Semeniuk, W. E. Loomis, and E. W. Lindstrom are given on the development of laboratory technics for detecting seed-borne pathogens; studies on corn diseases, including the development of inbred lines resistant to stalk and ear rots, physiological response of the growing plant and pathogen to chemical seed treatments, factors influencing the resistance of strains to smut (*Ustilago zeae*), *Diplodia* dry rot, pathogenicity of *Bast-sprium gallarum*, and the nature and methods of measuring disease resistance; and a plant disease survey of Iowa, including prevalence, distribution, and losses involved

[Plant disease studies by the Maryland Station] (*Maryland Sta. Rpt. 1940, pp. 25, 45-50.*)—Brief reports are included on the development of *Diplodia zeae* stalk rot-resistant dent corn inbreds; strawberry root disease; disease resistance in peas; seed improvement and disease resistance and control in potatoes; the physiology of tobacco mosaic virus; raspberry disease control; *Fusarium* wilt of cantaloup; apple scab and fruit spraying; tobacco *Fusarium* wilt; and tobacco downy mildew (blue mold) control.

[Plant disease work by the New Mexico Station] (*New Mexico Sta. Rpt. 1940, pp. 56-57.*)—Brief progress reports are given on projects dealing with the segregation and evaluation of the factors contributing to the development of pink root and associated bulb rot and false blight diseases of onions produced for seed, and root rot of sugar beets.

Contribution toward a host index to plant diseases in Oklahoma, C. C. Brown (*Oklahoma Sta. Mimeog. Cir. 33, rev. (1941), pp. [5]+81.*)—The author has attempted to bring together in a concise check list all available information on the occurrence, distribution, and importance of diseases of economic plants in Oklahoma. The original list (E. S. R., 82, p. 200) consisted of records of 819 diseases of 284 plant species. The revision adds 352 records, bringing the total to 1,171.

Proceedings of the Association of Applied Biologists (*Ann. Appl. Biol.* 27 (1940), No. 3, pp. 435-440).—Under the general title of Efficiency With Economy in the Control of Plant Diseases and Pests, the following papers are

given and here summarized: I, The General Problem and the Transition to War Conditions, by H. Martin; II, Protective Fungicides, by M. H. Moore; III, Some Entomological Aspects of the Problem, by S. G. Jary; IV, Some Factors Determining the Efficiency of Spraying Operations, by C. Davies; and V, Some Practical Aspects of Fruit Spraying, by A. J. Wooldridge.

A photoelectric method and its use for determination of fungus growth rates, L. A. ADAMS and E. J. MOORE (*Phytopathology*, 31 (1941), No. 5, pp. 448-452, figs. 2).—The authors describe a photoelectric apparatus for determining differences in density and size among fungus colonies. Using the cotton root-rot fungus, *Phymatotrichum omnivorum*, such readings are shown to agree well with determinations based on dry weights. It is said that 150 readings can be made per hour.

Seed-borne fungous diseases of horticultural plants, P. NEERGAARD (*Compt. Rend. Assoc. Internat. Essais Semences (Proc. Internat. Seed Testing Assoc.)*, 12 (1940), No. 1, pp. 47-71).—Annotated lists (over five pages of references) by hosts with their diseases and by pathogens, followed by brief discussion and tabulation of seed pathological methods.

Transmutation of bacterial plant pathogens, A. T. PUGSLEY (*Jour. Austral. Inst. Agr. Sci.*, 6 (1940), No. 4, pp. 195-197).—A brief review of variation, with special reference to dissociation into smooth and rough forms.

Bacteriophage of *Bacterium solanacearum* [trans. title], E. KAWAMURA (*Bul. Sci. Fakult. Terkult., Kyushu Imp. Univ., Fukuoka, Japan*, 9 (1940), No. 2, pp. 148-156, pl. 1; *Eng. abs.*, p. 156).—A report on the isolation by successive filtration of a high-potency bacteriophage from the bacteria causing brown rot of Solanaceae.

Cercospora? phaeochlora discovered in Chile, A. E. JENKINS and C. CHUPP. (U. S. D. A. and Cornell Univ.). (*Mycologia*, 33 (1941), No. 1, pp. 87-89, fig. 1).—This fungus is reported on *Lithraea caustica*, and an amended description is given.

Host relations in species of *Diplodia* and similar genera, N. E. STEVENS. (Univ. Ill.). (*Mycologia*, 33 (1941), No. 1, pp. 69-73).—From this general discussion it is believed much more probable that such fungi growing on dead or weakened plant parts, as well as on a wide variety of culture media, have a wide host range, than that a distinct fungus species grows on each host species.

Texas scientist reports progress in fight on root-rot disease, W. N. EZZELM. (Tex. Expt. Sta.). (*South. Florist and Nurseryman*, 50 (1940), No. 10, pp. 5-6, 20-21, 23-26, figs. 5).—A summary of present knowledge on *Phymatotrichum omnivorum* and its control.

Reaction of certain species of the genus *Oryza* to the infection of *Piricularia oryzae* [trans. title], E. KAWAMURA (*Bul. Sci. Fakult. Terkult., Kyushu Imp. Univ., Fukuoka, Japan*, 9 (1940), No. 2, pp. 157-166, pl. 1, figs. 3; *Eng. abs.*, p. 166).—The host-parasite relations of four species of *Oryza* to this parasite are discussed and illustrated.

Studies on the perennial rust *Puccinia minussensis*, A. M. BROWN (*Canad. Jour. Res.*, 19 (1941), No. 3, Sect. C, pp. 75-79, pl. 1).—Permanent infection of *Lactuca pulchella* by this rust was initiated by inoculating primary seedling leaves or rhizome buds of older plants with aeciospores or urediospores, or by packing teliospores into the leaf axils of mature plants and subsequently using the infected nodal portions as propagation cuttings. In primary leaves of seedlings the binucleate mycelium progressed along the midrib and petiole to the stem and advanced down it to the rhizomes, but before reaching their terminal buds it became uninucleate. Infected rhizome buds develop into young shoots that usually first produce pycnia. The perennial mycelium seems to alternate

from the binucleate to the uninucleate condition and vice versa, depending apparently on the maturity of the host tissue and the food supply available.

Germination of the conidia of *Sclerotinia fructicola*, with special reference to the toxicity of copper, C. K. LIN ([*New York*] *Cornell Sta. Mem.* 233 (1940), pp. 33, figs. 25).—The conidia of this species usually do not germinate in pure water and when they do it is by minute germ tubes, but adding a small amount of carbohydrate or ethyl alcohol induces a vigorous response. In the presence of sugar (but not of alcohol) the spores germinate under anaerobic conditions also, the energy supply here apparently being the limiting factor. Germination in a pure-dextrose or an alcohol solution is very variable, the percentage rarely exceeding 90, whereas 95–100 percent is obtained by adding a small amount of $MgSO_4$. At 0.1 mm per liter, $MgCl_2$, $Mg(NO_3)_2$, $CaSO_4$, $CaCl_2$, and basic potassium phosphate also increased the germinability, but aluminum chloride inhibited germination at all strengths tested. The effect of these salts on germination is evidently not due to any nutritional function, and a possible relation between the colloidal effect of the electrolytes and the activity of the spores is postulated.

In a pure-dextrose solution the "lethal dosage" of Cu was about 10–100 times lower than hitherto reported, the minimum number of atoms required to inhibit the germination of one spore being estimated as in the order of 10 billion. Electrolytes antidoted Cu toxicity and promoted spore germination, details being described and tabulated. The data are believed to warrant the statement that the effectiveness of electrolytes in antidoting Cu toxicity depends on the concentration and valency of the ions and on the pH. Assuming that Cu precipitates certain cell colloids, evidence is presented that the antidoting effect of electrolytes may be explained on the basis of peptization of the precipitated colloids. The primary toxic effect of Cu apparently is not to kill the spores, but prolonged treatment resulted in gradual loss of germinability in an electrolyte-dextrose solution, probably owing to an irreversible harmful process distinct from the primary toxic action. It is believed that the poison and the antidote cause the inactivation and reactivation, respectively, of the spores, since the normal cell functioning depends on the colloidal state of the protoplast. There is said to be a body of available evidence in the literature supporting a belief in the great biological significance of peptizing agents. There are three pages of references.

Observations on the disease of sea lyme-grass (*Elymus arenarius* L.) caused by *Ustilago hypodytes* (Schlecht.) Fries, T. E. T. BOND (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 330–337, pls. 2, figs. 3).—Infected plants normally remain sterile, producing in place of flowers leafy shoots, the morphology of which is described, but occasional normal flowering spikelets are formed in their upper part, which may be capable of forming grain. The disease also induces a modification in the rhizome growth habit. Similar symptoms were observed in *Agropyron acutum* but not on *A. junceum* or *Ammophila arenaria*. Mycelium was detected in each node of the rhizome and in every lateral bud and stem apex of excavated diseased plants of *E. arenarius*, whereas none occurred in healthy plants. Attempts to germinate the spores were unsuccessful, and inoculation tests were inconclusive. Various possible means of transmission of the disease are discussed in the light of available evidence.

Virus and vital organization, J. GRAINGER (*Nature* [London], 146 (1940), No. 3704, pp. 539–541, figs. 3).—A critical discussion (10 references) as to the nature of viruses, with the conclusion that they are probably living organisms.

A quantitative study of the interaction of viruses in plants, T. S. SADASIVAN (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 359–367, pl. 1, fig. 1).—When saps of healthy plants or saps containing unrelated viruses were mixed with potato virus

"X" or aucuba mosaic virus in vitro, there was an inhibition of lesion production on tobacco and *Nicotiana sylvestris* leaves but saps containing strains of related viruses had a greater and specific inhibitory action. This action by related strains was found due to the viruses themselves. In vivo inoculations of related strains showed that the local lesions of one strain are inhibited by another when the latter systemically infects its hosts, and that the efficiency depends on the concentration of the systemically infecting viruses in such hosts. The degree of inhibition of aucuba mosaic virus was directly proportional to the number of active units of tobacco mosaic virus present in the leaf at the time of reinoculation.

Effects of organic amendments upon the microflora of the rhizosphere of cotton and wheat, F. E. CLARK and C. THOM. (U. S. D. A. and Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), p. 230).—Addition of various sources of organic matter to the soil produced striking changes in the microbiological populations of the soil mass in general, but had little effect upon the organisms associated with crop roots themselves. The experiments were carried out with wheat in soil infected with *Ophiobolus graminis* and in sterilized soil and with cotton in soil infected with *Phymatotrichum omnivorum*. With respect to the effects upon root infections, it is concluded that "even though experimental controls of root-rotting parasites may be obtained by the inoculation of infested soil with saprophytic micro-organisms or filtrates thereof, it is questionable whether root surfaces can be protected on any practical scale in the field by inoculation procedures with common soil saprophytes."

Copper in soils and cultivated plants, with special reference to white tip disease [trans. title], F. STEENBERG (*Tidsskr. Planteavl*, 45 (1940), No. 2, pp. 259–368, figs. 10; *Eng. abs.*, pp. 358–363).—A monographic study and review (107 references) of white tip or reclamation disease and its amelioration by application of copper compounds to the soil.

A case of chlorine gas injury to shrubs, vines, grass, and weeds, E. J. MILLER and F. C. STRONG. (Mich. Expt. Sta.). (*Arborist's News*, 5 (1940), No. 10, pp. 73–74, fig. 1).

Experiments on adherence of fungicides [trans. title], R. OREGON BOTERO (*Rev. Cafetera Colombia*, 8 (1940), No. 105, pp. 2605–2606).—Note on tests of the adherence properties of several fungicides, mainly copper-containing.

Control mold in home germination tests, W. CROSSLER and S. PATRICK (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, p. 16).—The results of several thousand tests are briefly outlined as showing that molds in germination tests may be effectively controlled by various seed treatments without injury to the seeds.

Variation in *Helminthosporium sativum* induced by zinc sulphate, C. R. MILLIKAN (*Jour. Austral. Inst. Agr. Sci.*, 6 (1940), No. 4, pp. 203–205, figs. 3).—A preliminary report on this phase of studies on cereal root rot fungi.

Soil conditions and the *Fusarium culmorum* seedling blight of wheat, C. I. SEEN (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 323–329).—Using the glass tumbler technic, the intensity of infection was found to increase with density of spore suspension but was reduced by germinating the seed for 48 hr. or more before inoculation. Infection was most severe with low soil moisture and in acid soil. In nutrient sand culture, infection was highest in the minus-nutrient series and lowest with full nutrients. For reducing infection, N alone appeared to be as effective as the full nutrients, P was less effective, and K had no beneficial effect.

Soil conditions and the take-all disease of wheat.—V, Further experiments on the survival of *Ophiobolus graminis* in infected wheat stubble

buried in the soil, S. D. GARRETT (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 199-204).—The characteristic dark mycelium slowly continued to develop in straw after burial in the soil, but with greater and more sustained vigor in soils well supplied with N. Conditions such as high aeration favoring general microbiological activity in the soil hastened the disappearance of *Ophiobolus*, probably by promoting a more rapid consumption of the available food material by the fungus itself and by associated micro-organisms. The N supply normally limits both the amount of available food and the survival of *Ophiobolus*.

Races of smut and resistance of hard wheat varieties, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 4, pp. 5-7, fig. 1).—This note summarizes a test showing the wide differences in infectability of different races of *Tilletia tritici* and *T. levis* and the differences in susceptibility of several wheat varieties. The new wheats Rival, Mercury, and Premier exhibited marked resistance to all collections of bunts used in the tests.

Stemphylium leaf spot of red clover and alfalfa, O. F. SMITH. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 12, pp. 831-846, figs. 4).—The perfect stage of *S. botryosum*, here identified as *Pleospora herbarum*, was found on dead red clover stems in Wisconsin, and cultures from the typical echinulate conidia produced perithecia and ascospores when grown on sweetclover stems or potato-dextrose agar. The taxonomic relationship of this fungus to similar fungi reported on these hosts is discussed, and evidence is presented indicating that physiologic races exist on red clover and alfalfa.

Studies on mosaic of cowpeas, *Vigna sinensis*, D. M. McLEAN. (Ohio State Univ.). (*Phytopathology*, 31 (1941), No. 5, pp. 420-430, fig. 1).—This disease was first reported in 1921 in Arkansas, and the author's studies were conducted in Ohio, 1939-40. A dwarfed slender growth with a tendency toward excessive branching is generally associated, and starch synthesis is inhibited in the yellowish green areas of the mosaic leaves. Infected highly susceptible varieties commonly carry the virus in about 5 percent of the seeds. The virus was transmitted by artificial methods, but not with 100 percent regularity. It was also transmitted by the following aphids: *Macrosiphum solanifolii*, *M. pisi*, *Aphis gossypii*, *Myzus persicae*, and a black aphid (species undetermined). The bean leafhopper, tarnished plant bug, Mexican bean beetle, and the striped cucumber beetle failed as vectors. The virus was noninfective after aging in vitro for 48 hr. and in dilutions greater than 1:1,000. The thermal inactivation point was 72°-75° C. Attempts to infect the following species were unsuccessful: *Vicia faba*, *Pisum sativum*, *P. sativum arvense*, *Lathyrus odoratus*, *Phaseolus vulgaris*, *P. aureus*, *P. lunatus* var. Fordhook bush lima, *Lycopersicon esculentum*, *Solanum tuberosum*, *Petunia hybrida*, *Datura stramonium*, *Capsicum annuum*, *Zinnia elegans*, *Cucumis sativus*, *Nicotiana tabacum*, and *N. glutinosa*.

Sensation Refugees, two new mosaic-resistant varieties, M. E. ANDERSON (*Canner*, 92 (1941), No. 7, pp. 14-15, figs. 2).—The author reports that from an extensive breeding program covering several years, two new snap bean varieties appearing to have special merit have been evolved and are being introduced as Rogers Sensation Nos. 1066 and 1071.

Seed corn treatment advised this year, W. CROSIER (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 7, 8, 9).—Though dry rots of corn are practically unknown in the Northeast, seed treatment is advised because most of the seed stocks produced in New York in 1940 are weak in vitality and susceptible to decay by soil organisms. Laboratory and field tests have shown that the better known mercury dusts will control the molds on seeds and protect them from soil-rotting micro-organisms.

Field tests of the resistance of cotton to *Phymatotrichum omnivorum*, G. W. GOLDSMITH and E. J. MOORE (*Phytopathology*, 31 (1941), No. 5, pp. 452-463, fig. 1).—During two seasons, using selection based on fungus growth rates, the resistance to cotton root rot has been tested in the field and a definite increase in resistance has been produced. Resistance in some degree exists in many varieties of cotton. When these resistances are evaluated by laboratory tests selection brings about a general average increase in the character. However, this effect varies in degree with different varieties, among which Native Hopi and Sudan have proved most promising. In general, this method of selection and testing in the field has produced maximum results when F₂ hybrids are employed.

Cottonseed treatments in Tennessee, N. I. HANCOCK and D. M. SIMPSON. (Coop. U. S. D. A.). (*Tennessee Sta. Bul.* 175 (1941), pp. 15, fig. 1).—Seedling diseases are said to be a special hazard in Tennessee, where adverse growing conditions are common at planting time. Organic mercury dusts have proved to be inexpensive insurance against such troubles, New Improved Ceresan (1½ oz. per bushel of seed) being recommended but with care in handling and in keeping away from livestock. Seeds delinted either mechanically or by acid are planted more evenly and germinate more quickly under low temperature and soil moisture. Dry seeds untreated or treated with Ceresan can be stored profitably for future use.

Two types of fall *Panicum* smut, H. W. JOHNSON, H. A. RODENHEISER, and C. L. LEFEBVRE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 12, pp. 865-875, figs. 7).—In attempting to determine the effect of incubation-period temperature on the pathogenicity of *Norosporium syntherismae* on *P. dichotomiflorum*, it was found that 70.9, 72.5, 53.3, and 22.2 percent of smutted plants developed after chlamydospore-dusted seed had been incubated for 20 days at 5°, 10°, 15°, and 20° C., respectively. In this experiment, 1 smutted plant had buff sori composed of hyaline, smooth-walled chlamydospores, whereas the other 307 affected plants had the common black sori composed of brown, echinulate-walled chlamydospores. Single chlamydospore cultures of the buff-type smut were mycelial and stable, whereas those of the common black form were of the sporidial type with a pronounced tendency to sector. Inoculations with chlamydospores of the buff-type smut resulted in 68 smutted plants, all of which produced only buff sori. Similar inoculations of the dark type resulted in 240 infected plants, all of which produced only black sori. It is concluded that the buff smut is a result of mutation in *S. syntherismae* and that the change may involve several genetic factors, since the mutant differs from the common dark smut in spore color, marking of spore wall, spore shape and size to a minor extent, and in degree of pathogenicity.

Studies of *Alternaria solani* with special reference to its pathogenicity to potato tubers in relation to external factors [trans. title], H. KLAUS (*Phytopathol. Ztschr.*, 13 (1940), No. 2, pp. 126-195, figs. 15).—This is a review (78 references) and detailed study, including the distribution and description of the fungus and its life history and biology, methods used, conditions for mass spore production, environal influences on the development and spread of the fungus in the tuber tissues (temperature, moisture, CO₂, and O₂), and the wound reaction in relation to ecological factors and to the spread of the fungus.

Botrytis and Sclerotinia as potato tuber pathogens, G. B. RAMSEY. (U. S. D. A. et al.). (*Phytopathology*, 31 (1941), No. 5, pp. 439-448, figs. 2).—A *B. cinerea* type strain was isolated from California Bliss Triumph potatoes showing a semiwatery, brown, odorless decay. Wound inoculations indicated it to be strongly pathogenic to tubers held at 40° F. with high humidity, but similar

tests at 70° seldom resulted in decay. Freshly wounded tubers sprayed with spores suspended in water developed the characteristic decay at 40°, but not at 70°. Wound inoculated tubers, using *S. sclerotiorum*, developed decay in comparatively few instances at 70° and high humidity. Similar tests with *S. intermedia* also usually resulted in few infections, but most tubers inoculated with *S. minor* developed extensive decay within 2 weeks. At 40° and high humidity, *S. sclerotiorum* caused no decay and *S. minor* rarely produced a tuber rot, whereas *S. intermedia* usually caused an extensive white, watery soft rot. Bliss Triumph potatoes inoculated with *S. intermedia* and stored immediately at 32° developed decay within 2 weeks, but neither *S. sclerotiorum* nor *S. minor* caused decay at that temperature. Wounds in control tubers held at 40° with high humidity showed some suberization but no wound periderm within a month. At 70° in high humidity similar wounds showed extensive suberization and wound periderm within 3 days.

Purple dwarf, an undescribed potato disease, in Alberta, G. B. SANFORD and S. B. CLAY (*Canad. Jour. Res.*, 19 (1941), No. 3, Sect. C, pp. 68-74, pls. 4).—Preliminary studies indicated this disease to be perpetuated through the tubers, and the symptoms on plants derived from infected tubers either appear immediately on emergence or apparently fail to show up for the rest of the season. Apical growth is checked, the plant becomes stunted, the newer leaves become purplish along the margin and curl upwards, the phloem is disorganized, and a well-developed, brown dendritic necrosis extends from end to end of the tuber. The roots, stolons, and stem bases become brown and decay, in the order named. The pith in the upper stem and in the tuber usually remains normal in appearance. A virus etiology was suggested by successful transmission through grafting.

Bacterial wilt and soft rot (potato ring-rot) (*Maine Agr. Col. Ext. Cir.* 133 (1940), pp. [2], fig. 1).—An informational leaflet.

Control of bacterial ring rot of potatoes with special reference to the ultraviolet-light method for selecting disease-free seed stock, V. E. IVERSON and H. C. KELLY (*Montana Sta. Bul.* 386 (1940), pp. 15, figs. 4).—Experiments indicated the ultraviolet-light method for eliminating diseased tubers to be highly satisfactory, but proper equipment and complete knowledge of operation were found essential to satisfactory results. Some field spread of infection occurred under faulty conditions of irrigation and drainage, where the soil became waterlogged and remained so for several days. The most effective knife disinfectants tested to prevent spread were acid mercury, mercuric chloride, and iodine-potassium iodide solution, and the most effective seed disinfectants tested were the last two materials named.

Transfer of the bulb nematode—*Ditylenchus dipsaci* from *Tropaeolum polyphyllum*, a new host, to potatoes, R. J. HASTINGS (*Sci. Agr.*, 21 (1940), No. 3, pp. 115-116).—Symptoms of infestation on this new host are described. Transfers from it to potatoes showed the varieties Katahdin, Green Mountain, and Warba to be highly susceptible; White Rose, Houma, Early Epicure, and Irish Cobbler, moderately; and Early Rose, Raleigh, Sutton Reliance, and Beauty of Hebron, slightly so. No transfers were successful on Netteed Gem.

Diseases of rice, E. C. TULLIS. (Coop. Ark., La., and Tex. Expt. Stas.). (*U. S. Dept. Agr., Farmers' Bul.* 1854 (1940), pp. II+18, figs. 14).—The principal and minor diseases and their effects on rice stands, yields, and quality are briefly described, with suggested control methods.

A root rot of sugar beets due to *Alternaria tenuis* [trans. title], H. GRIS (*Phytopathol. Ztschr.*, 13 (1940), No. 2, pp. 196-206, figs. 7).

Mottle necrosis of sweet potatoes was troublesome, R. H. DAINES (*N. J. State Hort. Soc. News*, 21 (1940), No. 6, pp. 1257-1259).—A general discussion,

with special reference to New Jersey conditions and a progress report on studies of this virus disease by the New Jersey Experiment Stations.

New elements in the flora of fallow tobacco land in the Sumatra wrapper district and their importance for the slime disease problem (*Pseudomonas solanacearum*) [trans. title], H. G. VAN DER WEIJ (*Meded. Deli Proefsta. Medan*, 3, ser., No. 10 (1940), pp. 14-25; *Ing. abs.*, pp. 24, 25).—Tobacco in this district is grown between 8-yr. fallows. Tests are reported on the successful infection with bacterial wilt of several plant species occupying the land during these fallow periods.

Chemical control of tobacco mosaic [trans. title], H. G. VAN DER WEIJ (*Meded. Deli Proefsta. Medan*, 3, ser., No. 6 (1940), pp. 22, figs. 4; *Ing. abs.*, p. 22).—Experiments are described on the use of various solutions for disinfecting the hands of laborers in tobacco fields to prevent the spread of mosaic. Trisodium phosphate proved the most effective in inactivating the virus in solution, addition of soap increasing its effectiveness. Such disinfection and roguing of affected plants are recommended control measures.

Methods for the preparation of pure tobacco mosaic virus nucleoprotein (*Marmor tabaci* var. *vulgare*, Holmes), R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 4, pp. 401-403).—"A method is described for preparing pure samples of virus. The removal of pigments and the preparation of a clean white product is greatly facilitated by harvesting the leaves of infected plants immediately after a period of darkness. After a preliminary aeration of the juice the virus is precipitated by the addition of ammonium sulfate (to 15 percent). From this precipitate the virus is extracted with water and insoluble impurities removed by centrifuging. After several repetitions of this process the virus is precipitated by adding an equal volume of acetate buffer solution of pH 3.4. The isoelectrically precipitated virus is collected, redispersed in water, and dissolved by the slow addition of 0.02 N sodium hydroxide solution. After centrifuging, the process is repeated. A method of preparing dried samples of the virus for analysis is described."

Ultracentrifugation studies on tobacco mosaic and bushy stunt viruses, M. A. LAUFFER (*Jour. Phys. Chem.*, 44 (1940), No. 9, pp. 1137-1146, figs. 3).—On studying several samples of these viruses (prepared by centrifugation) at various concentrations in the centrifuge, the sedimenting boundaries of the two proved qualitatively similar but became diffuse more rapidly than they should owing to diffusion alone. There was considerable variability in the estimates of the sedimentation constants of these viruses. It was established that there is a strong dependence of the sedimentation constant in tobacco mosaic virus on the virus concentration, but it did not behave like a gel in the ultracentrifuge. The sedimentation constant of bushy stunt virus was almost independent of the virus concentration. The sedimentation constant of the mosaic virus at infinite dilution was 103×10^{-13} and that of bushy stunt virus 132.0×10^{-11} cm. per second per unit field.

Purification and properties of alfalfa-mosaic virus protein, A. F. ROSS (*Phytopathology*, 31 (1941), No. 5, pp. 394-410, figs. 2).—A high molecular weight nucleoprotein with properties of alfalfa mosaic virus, a virus known to be transmitted by a specific vector, was isolated from diseased tobacco plants by differential centrifugation at 0°-4° C. The virus preparations contained about 15 percent of a nucleic acid of the yeast nucleic acid type, about 0.65 percent S, and small amounts of extraneous carbohydrate. The virus appeared to be essentially spherical and had a specific gravity of 1.48 and a sedimentation constant of about 74×10^{-13} . It is said to be the smallest plant virus isolated, the molecular weight and diameter being 2.1×10^6 and 16.5 m μ , respectively. Freezing and thawing had only a slight effect on the purified

virus, but similar treatment of diseased plant material resulted in a measurable loss of virus. When purified it was reasonably stable at 4°, but it was rapidly inactivated at room temperature and was much less stable when in juice. Sodium sulfite and sodium hydrosulfite inactivated the virus, whereas cysteine had a stabilizing effect on partly purified but no effect on purified preparations. The virus was slightly more stable in 0.01 M phosphate buffer than in 0.1 M phosphate buffer or in water. Toluene helped to preserve it.

The juice of infected greenhouse-grown tobacco plants contained about 1 mg. of virus per cubic centimeter during winter and less in summer. When virus dissolved in 0.1 M phosphate buffer at pH 7 was rubbed on bean leaves, the number of lesions induced was proportional to the virus concentration over a limited range only. At concentrations less than 5×10^{-4} gm. per cubic centimeter, the number produced decreased more rapidly than did the virus concentration in the inoculum, and at 10^{-5} gm. per cubic centimeter few or no lesions resulted. The virus was inactivated and hydrolyzed by trypsin. The inactivation proceeded more rapidly than did the extensive hydrolysis of the high molecular weight protein. Insofar as determined, alfalfa mosaic virus nucleoprotein does not differ fundamentally from other virus nucleoproteins that have been isolated and for which no specific insect vectors are known.

The concentration of alfalfa-mosaic virus in tobacco plants at different periods of time after inoculation, A. F. Ross (*Phytopathology*, 31 (1941), No. 5, pp. 410-420, figs. 2).—When young tobacco plants are inoculated with this virus, their virus content increases from about the fourth to the twelfth day afterwards, then decreases rapidly. The juice from plants infected for 48 days or longer may be less than 1 percent as active as that from plants infected for only 12 days. In older plants most of the virus is located in the upper leaves, but even there the concentration is much less than that reached about 12 days after inoculation. The older leaves, previously containing a high concentration of virus, contain very small amounts and show no symptoms. Disappearance of symptoms is associated with loss of virus in such plants. It is suggested that such inoculated tobacco plants undergo a type of recovery similar to that exhibited by plants infected by tobacco ring spot virus, and that the two phenomena differ in that the alfalfa mosaic virus is unstable in vivo. Adding dipotassium phosphate to ground diseased tobacco plants before pressing out the juice more than doubled the amount of virus extracted. With juice so obtained, dilution over a limited range resulted in increasing the number of lesions produced. At medium dilutions the number of lesions was inversely proportional to the dilution, but at higher dilutions the decreases in number of lesions were much greater than would correspond to the dilution changes.

Brazilian bean varieties as plant indicators for the tobacco-mosaic virus, K. SILBERSCHMIDT and M. KRAMER (*Phytopathology*, 31 (1941), No. 5, pp. 430-439, figs. 3).—The primary leaves of 73 varieties of beans were inoculated with sap containing the virus, and the necrotic symptoms on the inoculated leaves were used to separate the varieties into 4 groups. Such separation depends on the number, size, type, and visibility of the necrotic lesions, in which group every variety will be included and its position within every group will be determined. In the discussion the authors endeavor to explain why they have not adopted for these purposes Price's classification, which is based exclusively on the character of the number of necrotic lesions.

A ring strain of tobacco common mosaic found on the pepper [trans. title], K. NAKATA and S. TAKIMOTO (*Bul. Sci. Fakult. Terkult., Kyushu Imp. Univ., Fukuoka, Japan.*, 9 (1940), No. 2, pp. 179-189, figs. 13; *Eng. abs.*, p. 189).—

This virus strain was observed to be spontaneous on a variety of pepper and was found to infect various Solanaceae but not cucurbits.

Studies on the "yellow tobacco mosaic" or "aucuba mosaic" of tomato [trans. title], K. NAKATA and S. TAKIMOTO (*Bul. Sci. Fakult. Terkult., Kyushu Imp. Univ., Fukuoka, Japan*, 9 (1940), No. 2, pp. 167-178, pl. 1, figs. 10; *Eng. abs.*, p. 178).—The symptoms of tobacco yellow mosaic are said to be identical to those shown by tomato aucuba mosaic, and its properties in general coincided with *Nicotiana virus 1 C. Datura stramonium*, *N. glutinosa*, and *N. glauca* produced primary local lesions on inoculated leaves, and many other Solanaceae formed yellow mottlings on the new leaves. The virus proved very resistant to high temperatures and chemicals and retained its infectivity for over a year in test tubes.

Host range and distribution of tomato big bud, A. V. HILL (*Jour. Austral. Inst. Agr. Sci.*, 6 (1940), No. 4, pp. 199-200, figs. 2).—A note on this virus disease.

Double-hill planting of tomato plants minimizes losses from curly-top disease, H. E. DOAST. (U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 1, p. 3, figs. 2).—Under the severe curly top conditions of 1940 in the experimental field reported upon, 82.8 percent of the originally planted standard stand of tomato plants survived in the double-hill plats at the end of the season, after the disease had taken its toll, as compared to 27 percent of the original plants in plats with one plant per hill. Cheesecloth protection during the period of vector prevalence also greatly reduced infection and the losses from late spring frosts, but the cost of this method is too great except where extensive damage from curly top occurs.

Fruit diseases in 1939, O. C. BOYD (*Amer. Pomol. Soc. Proc.*, 55 (1940), pp. 86-89).—A seasonal summary of weather conditions and diseases for Massachusetts.

Fruit diseases in 1939, W. D. MILLS. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 85 (1940), pp. 7-11).—A seasonal summary for New York State.

Nematode resistant deciduous rootstocks, L. H. DAY and W. P. TUTTS. (Univ. Calif.). (*Pacific Rural Press*, 140 (1940), No. 10, p. 314).—A progress report on the obtaining of resistant fruit-tree rootstocks.

Boron problems of apple orchards, A. B. BURRELL. (Cornell Univ.). (*Amer. Pomol. Soc. Proc.*, 55 (1940), pp. 168-171).—A brief summary of experimental work and the present status of knowledge regarding the control of internal and external cork, dieback, and rosette with boron, and on boron injury to apples.

Scald of sweet cherry nursery stock caused by *Bacterium syringae*, C. M. TUCKER. (Univ. Mo.). (*Missouri Acad. Sci. Proc.*, 5 (1940), No. 4, pp. 91-92).—An abstract.

Incidence of *Sclerotinia fructicola* and *S. laxa* on sweet cherries in Oregon, A. W. EVANS and C. E. OWENS. (Oreg. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 5, pp. 469-471).—To determine the relative percentages of these two fungi, causing blossom blight and fruit rot, respectively, cultures were isolated from blighted blossoms yielding 72.72 percent *S. fructicola* and 27.28 percent *S. laxa*, whereas from rotten fruit the respective percentages were 51.82 and 48.68.

Vein clearing, a transmissible disease of *Prunus*, S. M. ZELLER and A. W. EVANS. (Oreg. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 5, pp. 463-467, fig. 1).—This disease, discovered in the northwestern United States, is described as a new virosis affecting cherry and prune trees. No insect vector has yet been found. Symptoms of the vein-clearing and mottle leaf diseases of cherry are compared.

Attacking brown rot with a winter spray, E. E. WILSON. (Univ. Calif.). (*Pacific Rural Press*, 140 (1940), No. 10, p. 312).—A brief outline of recent improvements in controlling brown rot of stone fruits.

Zinc for stone fruits and apples, W. H. CHANDLER. (Univ. Calif.). (*Pacific Rural Press*, 140 (1940), No. 10, pp. 310–311).—A brief discussion of methods of applying zinc compounds in controlling Zn deficiencies of fruit trees in California.

Revamped spray schedules for small fruit diseases, R. F. SUIT (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 6, 8, fig. 1).—This is a brief outline of changes in spray schedules (some greatly simplified) brought about by recent experimental work for control of diseases of grapes, raspberries, currants, gooseberries, and strawberries.

Cane gall of brambles caused by *Phytomonas rubi* n. sp., E. M. HILDEBRAND. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 9, pp. 685–696, figs. 3).—Investigating this rather widely distributed but economically relatively unimportant disease of *Rubus* spp., the characteristic beading and elongate gall ridges on the above-ground fruiting canes were found markedly contrasted to crown gall (*P. tumefaciens*), which ordinarily occurs at or below the ground. The differential characters of these organisms are tabulated. *P. rubi* was readily isolated from young galls and described as a new species, its pathogenicity was proved, and it was studied in detail. Black raspberry, purple raspberry, blackberry, and red raspberry were successfully inoculated, but the last was only weakly parasitized and it is rarely infected in the field. Control measures for crown gall proved even more effective for cane gall because of the shorter survival in soil and the conspicuous character of affected plants.

Spraying grapes, with special reference to black rot, H. G. SWARTWOUT (*Missouri Sta. Cir.* 211 (1941), pp. [4]).—An informational leaflet.

Various agents and nonparasitic diseases of cacao [trans. title], G. BONDAR (*Campo [Rio de Janeiro]*, 9 (1938), No. 106, pp. 22–24, figs. 4).

A new disease of the coffee tree due to a species of *Fusarium* [trans. title], G. GARCÍA RADA ([Peru], *Min. Fomento, Dir. Agr. y Ganadería Bol.* 20 (1940), pp. 7, pls. 10).

Daffodil diseases, F. P. McWHORTER (*Jour. Calif. Hort. Soc.*, 1 (1940), No. 3, pp. 159–163).—A brief summary, including control measures.

The boron-deficiency disease of *Gloxinia* and its control, P. A. ARK and C. M. TOMPKINS. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 5, pp. 467–469, fig. 1).—This serious disease, exhibiting rapid blackening and wilting of the foliage followed by drying and death of the plant, is reported to occur in the San Francisco Bay region and at Capitola, Calif., and a similar trouble has also been observed on slipperwort. The disease is caused by boron deficiency in "ratsnest," a compost used locally as a culture medium for these plants. It may be readily controlled by several applications of a 6 percent solution of boric acid, applied every 2 weeks.

Diseases of roses, P. P. PIRONE (*New Jersey Stas. Cir.* 405 (1941), pp. 11, figs. 8).—A brief conspectus on rose diseases and their control, including mildew, black spot, rusts, mosaic, leaf spots, brown canker, common cane and graft cankers, brand canker, crown canker, and crown gall.

Mosaic and streak diseases of rose, P. BRIDGLEY and F. F. SMITH. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 9, pp. 625–660, figs. 10).—Chlorotic areas feathering away from the midribs, and ring, oak-leaf, and watermark patterns are characteristic mosaic symptoms. The yellow mosaics have brighter and lighter yellow patterns, and streak produces brown rings, brown or yellowish vein banding, and senescence patterns in the leaves and brownish or

greenish ring markings in the canes. Certain hybrid tea roses develop necrotic primary cane lesions when budded with streak-affected buds. Crinkle and speckle patterns giving no response in hybrid-tea test varieties are distinguished from rose mosaic. Mosaic, yellow mosaics, and streak were transmitted only by tissue union, and the minimum incubation period for each was about 20 days. No evidence of transmission was obtained with 31 insect species for mosaic or with 34 species for streak, and no seed transmission of either disease was detected in small populations of seedlings. Mosaic was widespread but less prevalent than previously reported, yellow mosaic occurred as scattered single plants, and streak was found in four States and the District of Columbia. All roses tested proved susceptible to mosaic and yellow mosaic, with symptoms varying and tending to mask in many varieties. Varieties of roses varied in response to streak, some appearing resistant or immune. Field tests in four States gave no evidence of natural spread of these diseases. Apparent spread is attributed to the nursery practice of propagating from the tops of budded plants. Use of indexed mother blocks as sources of understocks is suggested.

Observations on a disease of *Scilla campanulata* Ait. due to the stem and bulb eelworm, *Anguillulina dipsaci* Kühn, E. E. EDWARDS (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 422-432, pls. 2).—This is said to be the first record of this serious disease of *Scilla* in Britain, and the evidence indicates that infection probably originated by planting the bulbs in soil heavily infested with the biological race of *A. dipsaci* parasitizing *Primula* spp. The characteristic symptoms are described and the biology of the nematode is discussed, with special reference to its mode of entry into the host, movement within the tissues, and persistence in viable condition both on and within the seed. Results of infection tests on other plants are also detailed.

Rhizoctonia foot rot of stocks can be controlled, A. W. DMOCK (Cornell Univ.). (*Florists' Rev.*, 87 (1940), No. 2244, pp. 13-14, figs. 3).—The symptoms of this destructive disease are described and illustrated and control measures outlined. Experiments have shown that stocks are susceptible until they are at least 2 mo. old, but may remain so much longer, and that the causal fungus may spread through the soil at the rate of 10 in. per month. Perfect stands were obtained on heavily infected soil which had been sterilized either by steam or chloropicrin.

Cause and control of the Coryneum blight of oriental arbovitae, J. A. MILBRATH and F. P. McWHORTER (*Oregon Sta. Bul.* 382 (1940), pp. 12, figs. 2).—This disease, due to *C. berckmanii* and known as far back as 1930, is said to have become prevalent and serious in western Oregon and Washington. Most if not all varieties of *Thuja orientalis* are susceptible, but the American and European species appear to be immune. For effective control it is recommended that diseased foliage be pruned out during early summer and that both healthy and affected trees be sprayed with red copper oxide or tribasic copper sulfate in early fall before the rainy season to prevent new infections. The one application is said to be sufficient for healthy trees, but diseased ones should have a second treatment.

A chytrid inhabiting xylem in the moline elm, L. R. TEHON and H. A. HARRIS (*Mycologia*, 33 (1941), No. 1, pp. 118-129, figs. 14).—*Carpenterella molinea* n. gen. and sp. and the host-parasite relations are described and illustrated.

Root and butt rot in the pinetum at Michigan State College, F. C. STRONG (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 159-163, figs. 5).—A severe wind-storm in November 1940, blowing down many white pine trees in this pinetum, revealed the large extent, spread, and devastating effects of injury by *Polyporus schweinitzii*. From present information it appears that greater care should be

exercised in selecting favorable sites for white pine, since stagnation of growth and reduction of annual increment probably favor this fungus parasite. Except for recreational areas no economically feasible eradication method is known, but improvement of vigor by thinning and fertilization is recommended to discourage spread to still healthy trees.

Anomyctus xenurus, a new genus and species of Tylenchoidea (Nematoda), M. W. ALLEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 96-98, fig. 1).—This new form was secured from soil collected near the roots of shadscale, *Atriplex confertifolia*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology by the Iowa Station] (*Iowa Sta. Rpt.* 1940, pt. 1, pp. 174-178, 179-182, 184).—The work of the year (E. S. R., 82, p. 792) reported upon relates to quail and pheasant management, duck studies, life history, ecology, and management of the striped skunk (*Mephitis mesomelas avia*) and the spotted skunk (*Spilogale interrupta*), and an investigation of the ruffed grouse (*Bonasa umbellus umbellus*), all by T. G. Scott; analysis of environmental carrying capacity for wintering bobwhite quail and the ecology of the muskrat, both by P. L. Errington; ecology and management of the eastern mourning dove (*Zenaidura macroura carolinensis*) and the western mourning dove (*Z. macroura marginella*), the raccoon (*Procyon lotor*), the northern plains red fox (*Vulpes regalis*), and of the western fox squirrel (*Sciurus niger rufiventer*), all by Scott and G. O. Hendrickson; studies with the cottontail rabbit (*Sylvilagus floridanus mearnsi*), by Hendrickson; parasites and diseases of the fox, by E. R. Becker and E. A. Benbrook; and a preliminary survey of Iowa fishes, especially the channel catfish (*Ictalurus punctatus*), by R. M. Bailey.

The distribution of Iowa toads, R. M. and M. K. BAILEY. (*Iowa Expt. Sta.*) (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 2, pp. 169-177, pl. 1, figs. 2).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 116-124, figs. 2).—Contributions presented (E. S. R., 84, p. 642) are: Removal of *Gasterophilus* Eggs From Horse Hair, by S. W. Simmons (pp. 116-117) (U. S. D. A.); Egg Parasites of the Harlequin Bug in North Carolina, by C. B. Huffaker (pp. 117-118); *Septis* Larvae Attacking Wheat and Wild Rice, by J. H. Hawkins (p. 118) (Me. Expt. Sta.); Psocids Infest Chinchillas in Utah, by G. F. Knowlton and G. S. Stains (pp. 118-119) (Utah Sta.); Dust Mixtures of a Phenol Salt for Control of Mites, by J. F. Kagy and G. L. McCall (pp. 119-120), and Walnut Husk Fly Control Studies, by A. M. Boyce and B. R. Bartlett (pp. 120-121) (both Calif. Citrus Sta.); The Field Roach *Blattella vaga*, by R. A. Flock (p. 121) (Univ. Ariz.); Response of *Anabrus simplex* to Temperature, by I. La Rivero (pp. 121-122); Observations on the Periodical Cicada, by F. W. Craig (pp. 122-123); Attraction of *Rhagoletis pomonella* Adults to Protein Baits, by R. W. Dean (p. 123) (N. Y. State Sta.); and Insect Food of the Chipping Sparrow [*Spizella passerina arizonae*], by G. F. Knowlton and F. C. Harmston (pp. 123-124) (Utah Sta.).

Racial segregation in insect populations and its significance in applied entomology, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 1-13).—This discussion of changes that have occurred in the habits or other characteristics of species of insects of major importance which appear to be correlated with environmental changes brought about by agricultural practices is presented with a list of 30 references to the literature cited.

Laboratory rearing of certain leaf-eating insects, M. C. SWINGLE, J. B. GAHAN, and A. M. PHILLIPS. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 90-95, figs. 3).—A description is given of laboratory methods of rearing 12 leaf-eating insects for use in toxicological studies. Oviposition and rearing cages that were inexpensive and permitted the rearing of the insects in relatively large numbers are illustrated and described. Cages employing units that were interchangeable facilitated the rearing of the stock with a minimum of handling. A water fount, such as is used for watering young chicks, was found useful for maintaining foliage in a fresh condition.

An inexpensive insect mount, H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 4, pp. 8-9, fig. 1).

A bibliographical catalogue of the injurious arachnids and insects of Washington, M. H. HATCH (*Wash. Univ. [Seattle] Pubs., Biol.*, 1 (1938), No. 4, pp. [1]+165-223).—This catalog cites in systematic order those arachnids and insects that have been mentioned in literature or are otherwise known to be injurious in the State of Washington. A total of 641 species, representing 18 orders, are listed, of which some 210 are included without literature citation. Indexes to common names and to ordinal, family, and generic names are included.

[Entomological investigations of the Hawaii Station] (Hawaii Sta. Rpt. 1940, pp. 38-45, figs. 2).—A progress report (E. S. R., 83, p. 517) which mentions the following: Survey of insects destructive to garden beans, papaya, and potatoes, with notes on the bean pod borer *Maruca testulalis* and its control, and ecology of the tomato bug *Cyrtopeltis varians*, both by F. G. Holdaway and W. Look; biological control of cabbageworms and records as to the abundance of the cotton aphid, both by Holdaway and E. Lucas; corn earworms on tomatoes, by Holdaway; and insect pests (harlequin bug, *Nysius memorivagus*, and the beet armyworm) of miscellaneous crops, several insects not formerly recorded from Hawaii, and new host records for other species, all by Holdaway, Look, and Lucas.

[Entomological investigations of the Iowa Station] (Iowa Sta. Rpt. 1940, pts. 1, pp. 170-174, 178-179, 182-184; 2, pp. 54-56).—A progress report (E. S. R., 83, p. 85), which discusses in part 1 the studies on variation in resistance to American foulbrood in honeybees, by O. W. Park and F. B. Paddock; factors involved in the transformation of nectar into honey by the honeybee and influence of meteorological factors upon honey production, both by Park; wheat insects (the hessian fly, European wheat-stem sawfly, and the clay-colored bill bug *Colendra acqualis* (Gyll.)), onion insects (the black onion fly *Tritona fleura* Weld., brown onion fly *T. incurva* Loew, onion maggot, onion thrips, and onion mirid *Labopidea allii* Knight), and potato insects (the potato flea beetle, Colorado potato beetle, and potato leafhopper) and experiments for their control, all by C. J. Drake; insecticide investigations and apple insects (the codling moth, green fruitworms (*Graptolitha* spp.), yellow-necked caterpillar, apple grain aphid, apple leafhoppers, buffalo treehopper, grasshoppers (*Melanoplus* spp.), and apple maggot) and insecticide studies for their control, both by C. H. Richardson; insects injurious to man and animals (the turkey gnat, common malaria mosquito, *Anopheles punctipennis* Say, and *A. walkeri* Theob.) by Drake and Richardson; and grasshopper investigations, by Drake and G. C. Decker. Part 2 takes up corn insect studies, including those on stored corn pests; white grub investigations, by Drake and E. V. Collins; sod webworms, by Decker; and chinch bugs, by Drake, Richardson, and Decker.

[Entomological investigations of the Maryland Station] (Maryland Sta. Rpt. 1940, pp. 50-53).—A progress report (E. S. R., 82, p. 792) which reports data

on the biology and control of the corn earworm, sprays for the pea aphid and pistol casebearer, and Japanese beetle control, with special reference to the utilization of the milky white disease.

[Entomological investigations of the New Mexico Station] (*New Mexico Sta. Rpt. 1940*, pp. 41-55, figs. 4).—A progress report for the year (E. S. R., 83, p. 85) which includes notes on codling moth investigations, potato insect studies, and work with cotton and beet insects.

Colorado potato pests, L. B. DANIELS (*Colorado Sta. Bul. 465 (1941)*, pp. 28, figs. 9).—A practical account of the potato psyllid, potato flea beetle, the Colorado potato beetle, and minor pests, and based on Bulletin 437 (E. S. R., 78, p. 660).

On *Rubus* aphides and leaf-hoppers as possible vectors of raspberry mosaic, G. H. L. DICKER (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 275-286, fig. 1).—Eight species of aphids and leafhoppers known to occur on *Rubus* in Great Britain are discussed as possible vectors in the light of observations conducted at the East Malling Research Station during the last few years. No insect has yet conclusively been proved to transmit raspberry mosaic in Great Britain.

The grain storage insect problem in North Dakota, J. A. MUNRO and H. S. TELFORD (Coop. U. S. D. A. et al.). (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 4, pp. 9-12, figs. 3).—A practical discussion of this problem as it affects North Dakota, with a tabulated record of the species encountered.

Insect pest control a constant challenge to science (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 4, 14, figs. 3).—A popular discussion based on station projects.

Review of United States patents relating to pest control, [January-December 1940], R. C. ROARK (U. S. Dept. Agr., Bur. Ent. and Plant Quar., *Rev. U. S. Pat. Relat. Pest Control*, 13 (1940), Nos. 1, pp. 10; 2, pp. 13; 3, pp. 9; 4, pp. 10; 5, pp. 11; 6, pp. 9; 7, pp. 12; 8, pp. 8; 9, pp. 10; 10, pp. 11; 11, pp. 11; 12, pp. 11).—A continuation of this series (E. S. R., 82, p. 795).

Laboratory testing of natural and synthetic organic substances as insecticides, M. C. SWINGLE, A. M. PHILLIPS, and J. B. GAHAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 95-99, figs. 2).—A description is given of a settling dust chamber that was developed for the application of powdered samples to excised foliage in the course of laboratory tests of the toxicity of synthetic organic compounds and plant material to truck crop insects. This duster facilitated the application and measurement of the dust deposit and permitted the removal of the unused dust from the cylinder into an oil filter.

A study of clays used in preparation of tank-mix nicotine bentonite sprays, J. E. FAHEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 106-108).—In the work reported 27 bentonite clays obtained from 11 States and 2 Canadian provinces were tested along with 7 other absorbent materials to determine their value in the preparation of nicotine bentonite sprays. "Tests were made to determine their swelling value, whether or not suspensions prepared from them were flocculated by the addition of nicotine sulfate, and the quantity of nicotine removed by them from water solution. In general those clays that removed a high percentage of nicotine from water solution showed characteristic swelling when wet with water and were flocculated from water suspension by the addition of nicotine sulfate. The principal exception was a bentonite obtained from Mississippi which did not swell when wet with water and was not flocculated by the addition of nicotine sulfate but did remove 93.1 percent of the nicotine from water solution. Spraying tests showed that the residues resulting from clays flocculated by nicotine sulfate were blotchy in character and more resistant to

weathering than the spot-type residues deposited by clays that were not flocculated by nicotine sulfate."

Derris residue on marketable cabbage, C. C. CASSIDY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 72-74).—Derris having become one of the principal insecticides used in the control of certain truck crop insects, particularly the imported cabbageworm, an investigation of its residue on marketable cabbage was conducted. Analyses were made of marketable heads of cabbage that had been dusted at 7-day intervals with five applications of a derris plus clay mixture containing 1 percent rotenone. The effect of rain on the residue, the relative amounts of residue on three wrapper leaves, and the quantity of derris residue resulting from a single application were also determined. Statistical calculations show that among 11,600 heads from a single acre 1 U. S. No. 1 head might be encountered that would contain 73 p. p. m. of derris (0.525 gr. per pound).

A laboratory method for testing fumigants: Results with methyl bromide against the firebrat, J. M. GRAYSON and G. R. SWANT. (Iowa State Col.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 65-67, fig. 1).—A new method of laboratory fumigation which makes use of carefully weighed glass ampules for measuring exact quantities of the fumigant and is adaptable for mixtures of gases is described. The median lethal concentration for the firebrat was determined as 1.65 mg. per liter by this method.

Fumigating action of a mixture of orthodichlorobenzene and naphthalene applied by a new method, W. N. SULLIVAN, E. R. MCGOVAN, and L. D. GOODRUM. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 79-80).—A new method of applying a mixture of naphthalene and orthodichlorobenzene described consists "in rapidly volatilizing a solution of naphthalene in orthodichlorobenzene by spraying it onto a surface heated to 375° C. An effective dosage was obtained in about 8 min., and very little crystallization of the naphthalene followed. Eighty cc. of this solution was used in a 216-cu. ft. chamber in which flies and cockroaches were exposed for 24 hr. The mortality of the flies was 100 percent after 1 day, but more time was required for the cockroaches to die, the nymphs being more resistant than the adults. More than 95 percent were dead after 8 days and more than 99 percent after 10 days. The use of these materials applied by this method offers promise for the control of certain household and other insects."

Methyl bromide as a fumigant for pests of ornamental plants, E. M. LIVINGSTONE and G. R. SWANK. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 75-76, fig. 1).—The finding in experimental work that methyl bromide used against the white-fringed beetle and the related species *Pantomorus peregrinus* Buch. in dosages sufficient to kill larvae in small soil masses also eliminated some species of such foliage pests as scales, mealybugs, and whiteflies, as well as the common red spider, led to atmospheric fumigation tests with this insecticide against various insects attacking ornamental plants in New Orleans, La. "In all tests the mortality was complete. Observations made after treatment showed that no subsequent infestations developed on the plants. None of the plants except *Hibiscus*, *Dracaena* (M. Story), *Pothos wilcoxii*, and *Chrysanthemum* was affected by the fumigant. All the leaves except the terminals of *Hibiscus* dropped, but 3 mo. after treatment the plants had recovered. The lower leaves of *Chrysanthemum* browned."

A catalogue of the Plecoptera of the World, P. W. CLAASSEN ([*New York*] *Cornell Sta. Mem.* 232 (1940), pp. 235).—This includes an extensive bibliography.

The comejen-Nasutitermes costalis Holmg. [trans. title], G. N. WOLOCOOT. (P. R. Univ. Expt. Sta.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 32 (1940), No. 3, pp. 375-380, figs. 8).—A practical summary of information on this termite.

Lygus bug damage to alfalfa in relation to seed production, J. W. CARLSON. (U. S. D. A. coop. Utah and Wis. Expt. Stas.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 11, pp. 791-815, pl. 1, figs. 11).—Because of their effects on seed setting in alfalfa, *L. hesperus* Knight and *L. elisus* Van Duzee are probably an important factor in the major alfalfa seed crop failures in Utah and other Western States. Controlled infestation applied at several stages in the growth and development of the alfalfa resulted in typical symptoms of bud and flower damage and produced a distortion in the vegetative and reproductive development of the entire plant. Direct mechanical injury resulted from feeding punctures, but greater harm, shown by a deterioration of affected parts, appeared to follow the effects of a toxic substance emitted with the saliva of the feeding insect. Recovery from damage became apparent about 10 days following the removal of an infestation. Conspicuous evidence of *Lygus* damage in commercial alfalfa seed fields is shown by bleached buds, excessive proliferation of buds and leafy branches and bud resetting, a distortion and harshness in the texture of stems, short terminal internodes, and generally poor seed production with a high proportion of shriveled and discolored seeds.

Lygus injury to peaches in the Pacific Northwest and its prevention, J. B. MOORE and C. C. FOX (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 99-101, figs. 2).—Three species of *Lygus*, *L. elisus* Van D., *L. hesperus viridiscutatus* Knight, and *Lygus* sp., are said to cause "cat-facing" or "monkey-facing" of peaches in the Wenatchee area of the Pacific Northwest. A pyrethrum dust known as Pyrocide Dust proved to be very effective in preventing injury to peaches by *Lygus* and cutworms. Three dusts containing 0.2 percent pyrethrins were applied, the first when the buds were in the pink stage, the second just after petal fall, and the third after shuck fall. The picked crop, including all varieties of peaches, was 98.3 percent free from *Lygus* injury.

The chloroform-soluble components of beet leafhoppers as an indication of the distance they move in the spring, R. A. FULTON and V. EL. ROMNEY. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 10, pp. 737-743, figs. 3).—Beet leafhoppers were collected at various points along dispersal routes and analyzed for chloroform-soluble components in an effort to determine the distance those found in cultivated fields had traveled from their breeding source. Along a known long-distance dispersal route from the Colorado River drainage in Nevada northeastward into western Utah, the percentage of total extractives decreased from 38.4 in leafhoppers taken at the point nearest the breeding source to 8.9 in leafhoppers taken at the farthest point, 205 miles away. Along another suspected route from southern Arizona to Grand Valley, Colo., the percentage of extractives decreased from 39.5 to 6.6 over a distance of 398 miles. In collections made in southern Idaho, where more localized movements were suspected, the chloroform extractives of leafhoppers from breeding areas were 38.5, 35.1, and 25.7 percent for 3 yr., respectively, as compared with 38, 33.9, and 18.4 percent in the beet fields. According to the authors, the closeness of these figures for the two areas indicates that the beet-growing districts of southern Idaho are infested principally from adjacent breeding grounds. Chloroform extractives show a more consistent decrease as distance from the breeding source increases than do sweep-net counts, and it seems possible to distinguish between long-distance and local dispersions by determining the chloroform extractives of the leafhoppers collected along the known or suspected dispersal routes.

Toxicity of several nicotine compounds to *Aphis rumicis* L., R. HANSBERRY and L. B. NORTON (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 80-83).—The results of experimental work on the toxicity of nicotine compounds to the bean aphid, indicating the percentage of gross mortalities, are reported, the details being

given in table form. The most toxic group of compounds tested included "nicotine laurate, nicotine oleate, nicotine linoleate, nicotine stearate, and nicotine naphthenate. Nicotine alkaloid with sodium oleate as a spreader is about equal in toxicity to these compounds. A second and less toxic division contains a group of compounds with good to poor wetting properties, namely, nicotine alginate, nicotine Aresket, nicotine caseinate, and nicotine humate; a group consisting of dodecyl nicotinium iodide, didodecyl nicotinium diiodide, dodecyl nicotinium bromide, and didodecyl nicotinium dibromide, with excellent wetting and spreading properties; and a group of double salts with saponin as a wetting agent. Insoluble nicotine compounds included the sillcotungstate, pent, Reineckate, cuprocyanide, bentonite, and resorcinol formaldehyde. These had little or no toxicity to aphids. It is suggested that the first group of fatty and naphthenic acid combinations is the most efficient because of the combined toxicity of the alkaloid and the acid, the increase in efficiency due to the wetting and spreading power of the compound, and an unknown activating or synergistic action."

The turnip aphid in the Southern States and methods for its control, N. ALLEN and P. K. HARRISON (*U. S. Dept. Agr., Farmers' Bul. 1863 (1941), pp. 11-10, figs. 8*).—A practical account.

Aphids and their relation to the field transmission of potato virus diseases in northeastern Maine, G. W. SIMPSON (*Maine Sta. Bul. 403 (1940), pp. [5]+189-305, figs. 7*).—The four species of aphids commonly found in Aroostook County were the green peach aphid, the foxglove aphid *Myzus pseudosolani* Theob., the potato aphid, and the buckthorn aphid *Aphis abbreviata* Patch. Apparent differences in the distribution of the four were found which might be attributed in part to differences in the geographical relationship of seed plats to primary aphid host plants. Early-planted plats were infested before late-planted plats; infestations in the former were mostly initiated by winged migrants, while in the latter the infestation was initiated in most cases by dispersal forms. Aphid population studies in seed plats have indicated that the green peach aphid is more numerous in years when excessive spread of virus occurs than in years when it does not occur. When seed plats were not adequately isolated from other potatoes unsatisfactory seed stocks resulted. Early roguing of plants exhibiting virus disease symptoms usually removed infection centers before plant lice became numerous and was most effective where isolation was adequate.

Sprays to control the scotch pine scale, *Toumeyella numismaticum*, E. I. McDANIEL (*Michigan Sta. Quart. Bul., 23 (1941), No. 3, pp. 151-152*).—Eleven spray mixtures were applied between April 10 and 17, 1940, to a heavy infestation of this scale in a uniform planting of Jack pine. According to the author, samples from the sprayed trees selected July 15 demonstrated that all the sprays were 100 percent effective when the scales were hit.

Factors influencing the results of fumigation of the California red scale, D. L. LINDGREEN (*Hilgardia [California Sta.], 13 (1941), No. 9, pp. 491-511, figs. 3*).—A high-peak type of HCN concentration shows trends toward more efficient control than the low, uniform type in the range of dosages tried. Little difference in kill of the nonresistant red scale existed between exposures of 15, 30, and 45 min. With the resistant strain, low dosages and short exposures of HCN gave unsatisfactory results. In 9 out of 11 cases, slightly higher mortality resulted from a 45-min. exposure than from a 30-min. exposure in both the nonresistant and resistant red scales, but the differences were not statistically significant. When the resistant and nonresistant red scales were reconditioned at 50° F. for from 3 to 4 hr. previous to fumigation, a higher mortality resulted than when pre-

conditioned at 75° or at 90°. Resistant scales prefumigated with a sublethal dose of HCN under laboratory conditions just before fumigation gave a lower percentage of kill by fumigation than those receiving no prefumigation treatment. When nonresistant red scales were prefumigated with a sublethal dose of HCN 1 hr. before the regular fumigation a lower percentage of kill was obtained by fumigation than with those which had received no prefumigation treatment. Resistant red scales preconditioned at 50° for from 3 to 4 hr. and then prefumigated with a low dosage of HCN before the regular fumigation were more easily killed by HCN than those that were only prefumigated before the regular fumigation, but more insects survived than those preconditioned at 50° but not prefumigated, indicating that preconditioning at 50° does not overcome the effects of protective stupefaction. With the nonresistant scales, preconditioning at 50° overcame the effects of the prefumigation charge of HCN, for the data indicate that no protective stupefaction occurred. The motile young of the nonresistant red scale were least resistant to HCN, while the early gray adults were the most resistant of the stages tested. With the case of the resistant red scale, the motile young were also least resistant to HCN, but scales in the second molt were the most resistant. As the scales passed from the early gray adult to the late gray adult they became more susceptible to HCN in both the nonresistant and resistant strains.

Inheritance of resistance to hydrocyanic acid fumigation in the California red scale. R. C. DICKSON (*Hilgardia* [California Sta.], 13 (1941), No. 9, pp. 515-522, figs. 2).—The ability to resist HCN fumigation in the California red scale depends on a single gene (or group of closely linked genes) in the X chromosome and is therefore sex-linked. The mass-crossing method was used to obtain crosses between the resistant and nonresistant strains. Reciprocal F₁ crosses and four classes of F₁ crosses were also made. All of these were fumigated together with the parental material. The F₁ females were found intermediate in percentage of survival between the two parental strains, and the F₂ females intermediate in percentage of survival between the F₁ females and that strain to which their paternal grandmothers belonged. It is concluded by the author that the California red scale population contained individuals in which the resistance factor was present, and the regular control of the pest by HCN fumigation in California increased the percentage of resistant individuals in the population because of their preferential survival. Further, with continued fumigation, the California red scale will become generally resistant to such control until practically all the population is of the pure resistant strain, and once this condition is reached there should be no appreciable increase in resistance.

Fumigation of purple scale with hydrocyanic acid. D. L. LINDEREN and R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 59-64, fig. 1).—The authors have found purple scales in the crawler stage of development to be most susceptible to fumigation with HCN. "Other stages easily killed are those of early first and second molts, second instar, and those from just past the second molt through the period in which the main scale covering is laid down. Purple scale eggs in the first half of their developmental period are more difficult to kill by HCN fumigation than any other stage in the development of the insect. Other stages difficult to kill are the eggs in the last half of their development, the recently settled insects, the late first molt, the late second molt, and the mature egg-laying insects. No protective stupefaction was demonstrated in the purple scale under the conditions of these experiments. Mature insects and insects just past the second molt, preconditioned at 50° F., were more easily killed than those preconditioned at 75°, while the latter, in turn, succumbed more readily than those preconditioned at 90°. On the other hand, young purple scale eggs precondi-

tioned at 90° were more readily killed than eggs preconditioned at 50° or 75°. Fumigation at 90° resulted in a higher mortality of mature purple scale than that at 75°. There was little difference in the mortality of purple scale just past the second molt, whether fumigated at 75° or 90°."

A snail-collecting aphid-lion larva: A preliminary study of external features. D. T. JONES (*Marietta Col. Res. Pub., Zool. Ser., 1 (1929), No. 1, pp. [1]+9, pls. 3*).—Report is made of a study in Ohio of a chrysopid larva which bears a number of minute snail shells on its back (see below).

Further notes on the snail-collecting aphid-lion larva (Neuroptera: Chrysopidae). D. T. JONES (*Ent. News, 52 (1941), No. 2, pp. 39-44*).—The study carried on in continuation of that above noted indicates that the aphid lion larva observed is probably *Nodita virginica* (Fitch).

The walnut datana. E. HIXSON (*Oklahoma Sta. Bul. 246 (1941), pp. 29, figs. 9*).—An outbreak of the walnut caterpillar during the fall of 1935, the spring of 1936, and the entire summer of 1937 was the first to have been recorded in Oklahoma. Its attack resulted in the complete defoliation of as high as 50 percent of the black walnut and pecan trees, and no more than 10 percent escaped some defoliation. By 1938 its parasites and predators had increased, and but little damage was caused.

Its life history and control were under study at Stillwater during 1937 and 1938. The principal host plants in Oklahoma are black walnut, pecan, and hickory. The completion of a generation required an average of 59 days. The eggs hatched in from 6 to 7 days after deposition, and the duration of the larval and pupal stages averaged 19 and 33 days, respectively, during the summer. The insect hibernated as a pupa, remaining in this stage for a period of from 7 to 11 mo. The eggs were laid in clusters averaging 800 each on the under sides of the leaves in the lower part of the tree. Measurements showed that the average distance of the egg masses above the ground was 7.8 ft., the range being from 3 to 18 ft. In the first of the five instars, the larvae fed on the upper side of the leaf, eating only the upper layer of cells. All other instar larvae ate the entire leaf. The number of leaves eaten by each larva during its development averaged 0.9. The pupal stage was spent in the ground at a depth of from 1 to 3 in. The first-generation moths were on the wing and were collected in trap lights during May and June and the second generation during July, August, and September. Spraying with 3 lb. of lead arsenate, 6 lb. of lime, and 100 gal. of water was found to be effective against this pest. One-half pt. of fish oil per 100 gal. of spray increased the adherence of arsenic on the leaves by about 50 percent. Cutting off or pruning the leaves or branches with the clusters of larvae and placing them on the soil at some distance from the tree, or burning the caterpillars with a torch, were also effective controls, provided the pruning or burning was done before the larvae reached the fifth instar. At this stage the larvae scattered over the tree and were more active and difficult to kill. Dusting with calcium arsenate 20 to 25 lb. per acre was found effective in killing the larvae, but its only possibility of practicable use would be in native groves and applied with an airplane, a method still to be proven profitable for pecan groves.

Sheep feeding upon the vegetation under a block of pecan trees sprayed with lead arsenate and under another block dusted with calcium arsenate at the above rates showed no ill effects after being confined in pens under the trees for from 3 to 7 days, during which time they ate most of the contaminated vegetation.

Methyl bromide fumigation for destruction of the strawberry crown borer. P. O. RITCHER. (Ky. Expt. Sta.). (*Jour. Econ. Ent., 34 (1941), No. 1, pp. 67-72*).—A study was made of methyl bromide fumigation at atmospheric

pressure for the destruction of all stages of the strawberry crown borer in plants to be used for setting new patches. "Complete mortality of adults was secured with a minimum dosage of 2 lb. of methyl bromide per 1,000 cu. ft. for a 2-hr. period within a temperature range of from 68° to 85° F. Complete mortality of eggs resulted with a minimum dosage of 3 lb. per 1,000 cu. ft. for a 2-hr. period within a temperature range of 61° to 84°. Mortality of larvae was complete at a minimum dosage of 3 lb. of methyl bromide per 1,000 cu. ft. for a 2-hr. period at temperatures above 70°. No injury to dormant plants resulted from a 2-hr. exposure to 3 lb. of methyl bromide per 1,000 cu. ft. at temperatures below 80°. Nondormant plants were uninjured by a 2-hr. exposure to 2 lb. of fumigant per 1,000 cu. ft., but were severely injured by 3- and 4-hr. exposure to 3 lb. of methyl bromide per 1,000 cu. ft. Fumigation of dormant strawberry plants before April 1 with a dosage of 3 lb. of methyl bromide per 1,000 cu. ft. of space for a 2-hr. period at a minimum temperature of 70° is suggested to free strawberry plants from crown borer."

Field spraying for control of grapeberry moth, R. HUTSON. (Mich. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 102-105, fig. 1).—The conditions obtaining in the Michigan grape-growing belt, namely, an early, heavy first brood attack by the grape berry moth at blooming, require heavy spraying at that time for good control. "The spray schedules which can then be applied profitably are somewhat restricted by the necessity for heavy spraying with bordeaux, which is incompatible with some of the possibly effective materials. The low-soluble proprietary coppers offer a partial solution of the problem, since some of these materials are compatible with effective materials. Lead and calcium arsenates are equally effective against grape berry moth. Black Leaf Concentrate can be substituted for the arsenicals with equal or better results. A split schedule consisting of two sprays of an arsenical with oil before and one just after bloom and at least two additional sprays of Black Leaf Concentrate will control grape berry moth and leafhoppers at the same time. Under the experimental conditions, the presence of a good wetting agent seems necessary in the applications at blooming time to assure their penetration into the webs in the clusters. Telescoping the major portion of the spraying program into a period while the grapes are small apparently cuts down the possibility of excessive residue at harvest."

Orchard observations of the emergence of codling moths from two-year-old larvae, M. A. YOTHERS and F. W. CARLSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 109-110, fig. 1).—Observations conducted in an orchard in the Yakima district of Washington, heavily infested in 1938 but with many fruitless trees in 1939, are reported. In three lots in which a total of 980 moths emerged in 1940 in cages placed about the trunks of trees to which larvae were attached to a depth of 3 in. and in soil within 4 in. therefrom, all but about 100 are known to have come from larvae of the 1938 season. This is considered to furnish substantial proof that some healthy hibernating codling moth larvae may fail to transform the season following hibernation and may under certain conditions transform to moths at least two seasons later.

The influence of low temperature on the pupation of *Ephestia kuehniella* Zeller, E. CASPARI (*Jour. Expt. Zool.*, 86 (1941), No. 3, pp. 321-331, fig. 1).—The studies reported show that old prepupae of the Mediterranean flour moth "can pupate at low temperature (6°-9° C.). A high percentage of younger prepupae pupate also at this temperature, as well as few old larvae. Many young prepupae and most old larvae are not able to pupate at low temperature. They develop into 'permanent larvae,' surviving considerably longer than their pupating age mates, without pupating. Larvae kept for 2-8 mo. at low

temperature are able to pupate if returned to room temperature. If, however, their heads, the source of the pupation hormone, are tied off, they become permanent larvae, surviving as long as 2-3 mo. in the larval state. It is concluded that the formation of the pupation hormone is inhibited by exposure to low temperature, and there is some indication that the tissues are perhaps able to react to a hormone stimulus at low temperature." A list of 13 references to the literature cited is included.

The tomato fruit worm in Tennessee, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Bul.* 174 (1941), pp. 18, figs. 10).—This is the most serious tomato insect pest in Tennessee. The larvae bore into the tomatoes and are capable of destroying 25 percent or more of a crop. Oviposition starts when the young fruits begin to set (about May 15 in early seasons), and small worms and injured tomatoes may be observed in late May and early June. Where corn was planted as a trap crop among the tomatoes, the infestation was increased. The electrocutor type of light traps gave negative results. Of the insecticides tested, best results were obtained with three applications of a bait consisting of 10 percent cryolite in corn meal or cottonseed meal applied by hand to the fruit clusters. Cryolite sprays (3 lb. to 50 gal. of water) also gave good control, and, according to the authors, neither the cryolite baits nor sprays on tomatoes resulted in a residue problem. Cryolite (8 lb. to 150 gal. of water) gave the best control of this pest on lima beans; magnesium arsenate on the other hand was of no value.

Structure and development of the alimentary canal of the southern armyworm larva, P. A. WOKE (*U. S. Dept. Agr., Tech. Bul.* 762 (1941), pp. 29, figs. 9).—The alimentary canal of the southern armyworm was found to be similar to that of other lepidopterous larvae already described. Both foregut and hind-gut increase in size by the increase of the constituent cells, and the mid-gut increases in size partly in this manner but primarily by an increase in numbers of cells. Columnar and calyciform cells are already differentiated at hatching and reach full size during the second stadium. It was observed that interstitial cells arise during the first stadium, develop during the first and early part of the second stadiums, differentiate into calyciform and columnar cells, and complete development. Interstitial cells that develop in this manner are of the same size and appearance as those that develop from the primordial cells. There is a continuous production of new epithelial cells throughout larval life by development and differentiation from interstitial cells.

Lethal concentration and mode of action of copper sulphate used as a mosquito larvicide, J. S. KENNEDY (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 86-89).—Experiments with young larvae of North German and Portuguese ("*cam-bournaci*," Roubad & Treillard 1936) strains of *Anopheles maculipennis atroparvus* have shown "that fatal concentrations of anhydrous copper sulfate are 1 part in 50,000 to 100,000 of an otherwise favorable artificial medium at 27° C. At such concentrations the main effect is a direct poisoning of the larvae, but in greater dilutions the destruction of the food may play a greater part. The addition of much less CuSO₄ is required to kill larvae in natural waters in which copper carbonate is precipitated, probably because the larvae take in more copper when it is present in this solid form."

Toxicity to the housefly of the noncrystalline constituents of roots of *Tephrosia virginiana*, L. D. GOODHUE and W. N. SULLIVAN. (*U. S. D. A.*) (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 77-78).—In the work reported, three fractions of the noncrystalline portion of *T. virginiana* resin were prepared and the toxicity of each to the housefly compared with that of rotenone. The neutral-resin fraction, which comprises approximately 50 percent of the total extractives,

was found to have considerable toxicity, but the alkali-soluble portion, 9 percent, and the oil, 23 percent, were nontoxic. The crystalline compounds $C_{21}H_{42}O_4$ and $C_{22}H_{44}O_4$ which were isolated from the neutral resin were nontoxic to the housefly.

The influence of sodium and calcium chlorides on toxicity of nicotine to eggs of *Musca domestica* L., J. W. APPLE (Iowa State Col.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 84-85, fig. 1).—In a study of the toxicity of nicotine to housefly eggs, "the median lethal dose of nicotine in distilled water was 0.517 ± 0.009 percent, as compared with 0.405 ± 0.011 percent in normal chloride solution and 1.273 ± 0.055 percent in normal calcium chloride solution."

Twelve new North American species of *Oscinella* (Diptera: Chloropidae), C. W. SABROSKY (*Canad. Ent.*, 72 (1940), No. 11, pp. 214-230, pl. 1; abs. in *Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, p. 192).—Descriptions are given of 12 new species of *Oscinella*, together with a table for their identification. The larvae of a number of species of this genus attack various gramin and grasses.

The use of traps against the Japanese beetle, W. E. FLEMING, E. D. BURGESS, and W. W. MAINES (*U. S. Dept. Agr. Cir.* 594 (1940), pp. 12, figs. 3).—This publication notes that traps are of value for determining the presence of the Japanese beetle in an area remote from the generally infested region and in reducing the density of the population. Beetles are drawn from the leeward to a trap by means of bait (geraniol 10 parts, eugenol 1 part). Most of those captured are ones which fly into the superstructure of the trap and then fall into a receptacle from which they cannot escape. Structural features of the traps are: (1) A four-winged baffle mounted on top of a funnel, (2) a device for fastening the bait dispenser, and (3) a container for holding the captured beetles. Traps painted yellow have been found superior to those painted other colors, and paints with a high luster are recommended.

The Japanese beetle and its control, C. H. HADLEY (*U. S. Dept. Agr., Farmers' Bul.* 1856 (1940), pp. [2]+22, pls. 2, figs. 15).—A practical account.

The outlook with regard to the Japanese beetle, E. N. COEY (*Arborist's News*, 6 (1941), No. 4, pp. 25-26).

Japanese beetle control with natural enemies, E. H. SMITH (*Farm Res. [New York State Sta.]*, 7 (1941), No. 2, pp. 2, 10, figs. 4).—A popular discussion.

Biological notes on two species of *Melanophila*, A. S. WEST, JR. (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 43-45, figs. 3).—This discussion relates to the California flatheaded borer *M. californica* Van Dyke and the pine flatheaded borer *M. gentilis* Lec. found in ponderosa pine and Jeffrey pine in northeastern California.

Studies of the sweet potato weevils of the subfamily Cyladinae, W. D. PIERCE (*South. Calif. Acad. Sci. Bul.*, 39 (1940), No. 3, pp. 205-228, pls. 3).—Comparative measurements of the three forms that attack sweetpotato and studies of the immature stages of the genitalia and of the genera and species of Cyladinae are reported upon. The genus *Protocylas* is erected.

Biological observations on *Xylosandrus germanus* (Bldfd.), C. H. HOFFMANN. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 38-42, figs. 2).—The finding that *X. germanus*, an introduced oriental ambrosia beetle now established in the United States and reared from a number of woody plants, breeds in elm and may be an inoculative agent of the Dutch elm disease fungus led to this study of its life history and habits. "Ordinarily the species attacks stumps, logs, wind-broken branches, and moribund trees in this country. Female adults form irregular brood burrows in suitable host material, and the wood about the burrows is stained blue or black. The larvae feed on the ambrosia in the burrow, and it is not unusual to find all stages of the species living

together within a single burrow. Issuance of adults obtained by rearing field-infested material showed that the life cycle could be completed in 4 or 5 weeks, and that two generations, possibly three, occur yearly in New Jersey."

Bark beetles of the genus *Hylastes* Erichson in North America, M. W. BLACKMAN (U. S. Dept. Agr., Misc. Pub. 417 (1941), pp. 27).—This taxonomic revision of the genus *Hylastes* occurring in America north of Mexico includes a description of the genus, synonymy discussions, a key, and detailed description of the 21 species considered valid by the author. Seven of the species are described as new: *H. subopacus* from New Mexico, Utah, and Colorado, *H. webbi* from South Dakota and Montana, *H. canadensis* from Manitoba, Canada, *H. fulgidus* and *H. parvus* from New Mexico and Arizona, *H. pusillus* from Florida, and *H. minutus* from Nevada, California, Montana, and Oregon.

A manual of bee husbandry, R. S. FILLER (New Jersey Stas. Cir. 404 (1941), pp. 79, figs. 42).—A detailed practical account.

Alfalfa nectar and the honeybee, G. H. VANSELL. (U. S. D. A. and Univ. Calif.). (Jour. Econ. Ent., 34 (1941), No. 1, pp. 21-23).—Observations in the field and under controlled conditions in the greenhouse indicate that alfalfa nectar secretion and the sugar concentration values are affected by the following factors: A longer light day stimulates earlier blossoming and thereby lengthens the seasonal nectar secretion period in alfalfa. The Turkestan variety yields more and richer nectar than does the Common variety. The larger blossoms provide the most nectar. Continuous warmth under greenhouse conditions results in maximum secretion. Sugar concentration is increased by lowering soil moisture and also by lowering the relative humidity of the atmosphere.

Vitamin content of bee foods.—III, Vitamin A and riboflavin content of bee bread, M. H. HAYDAK and L. S. PALMER. (Minn. Expt. Sta.). (Jour. Econ. Ent., 34 (1941), No. 1, pp. 37-38).—In this further contribution (El. S. R., 83, p. 378) description is given of a biological assay in which laboratory rats were fed various levels of bee bread in order to evaluate the vitamin A activity and riboflavin content of this food of honeybees. The vitamin A activity was found equal to that of 6 and 8.4 International Units per gram of fresh and dry matter, respectively. The riboflavin content was equal to 20γ per 1 gm. of fresh and 28γ per gram of dry matter of the bee bread.

The behavior of young bees in confinement, E. F. PHILLIPS. (Cornell Univ.). (Jour. Econ. Ent., 34 (1941), No. 1, pp. 33-36).

Studies on toxicity to honeybees of acid lead arsenate, calcium arsenate, phenothiazine, and cryolite, L. M. BERTHOFF and J. E. PIRSON. (U. S. D. A. et al.). (Jour. Econ. Ent., 34 (1941), No. 1, pp. 24-33, figs. 4). The results of tests with various insecticides used for the control of the codling moth and other pests on fruit trees, etc., in the search for one that is harmless to honeybees are reported. "When ordinary commercial insecticides were used, unclassified as to particle size, the calcium arsenate proved to be most toxic, practically as toxic as the soluble arsenic pentoxide, and lead arsenate much less toxic, the median lethal doses of the two being approximately 0.6 μg. and 13.4 μg. of elemental arsenic per bee, respectively. Phenothiazine was scarcely toxic at all, even in doses up to 570 μg. per bee. When materials of different particle size were used, the fine fractions were on the whole more toxic than the coarse. All sizes of calcium arsenate particles proved, however, to be more toxic than even the finest lead arsenate. Cryolite was fairly toxic. . . . The median lethal doses of the arsenicals and of cryolite, in micrograms of active ingredient per bee, were as follows: Calcium arsenate (As), fine and medium 0.7, commercial 0.6, coarse 1.3; acid lead arsenate (As), fine 5, commercial 13, coarse 185; [and] synthetic cryolite (F), fine 4.2, medium 5.5, coarse 13.

... From these laboratory experiments it appears that phenothiazine in fine or medium-sized particles and, to a lesser degree, coarse acid lead arsenate meet the requirements for a codling moth insecticide that is nonpoisonous to bees. The practicability of the use of phenothiazine under field conditions remains to be determined, and if field tests show the desirability of continuing with lead arsenate, the problem may be solved by the use of a coarser form of this material for the treatment of plants."

Bee poisoning: A review of the more important literature, F. R. SHAW. (Mass. State Col.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 16-21).—This review is presented with a list of 46 references to the literature.

The establishment in Puerto Rico of *Larra americana* Saussure, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 53-56).—Report is made of the introduction from Brazil of the mole cricket or changa parasite *L. americana* and its establishment in Puerto Rico.

The effect of varying conditions on oviposition by *Trichogramma* on eggs of angoumois grain moths, L. A. COSTAS. (Mich. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 57-58).—The author is led to conclude from experiments conducted in Puerto Rico that *T. minutum* is not equally efficient as a parasite in all environments, and that its response to the environment determines, to a great extent, its parasitic potential.

Experiments with *Trichogramma minutum* Riley as a control of the sugarcane borer in Louisiana, H. A. JAYNES and E. K. BYNUM. (Partly coop. La. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 743 (1941), pp. 43, figs. 4).—Experiments were conducted for three seasons to determine whether the sugarcane borer could be controlled in Louisiana by mass liberations of *T. minutum*. From a comparison of the number of joints bored externally and internally, it was apparent that the count of joints bored externally could be used as a reliable indication of actual internal borer injury. A definite correlation was found between the percentage of parasitization and host density.

Each experiment consisted of a colonized and a check area which were separated by a buffer area in 1934 and in most cases in 1933. During the three seasons parasites were released at rates of from 10,000 to 45,000 per acre. Little difference was observed between the percentages of parasitization in the colonized, buffer, and check plats, and borer infestations in the plats in which *Trichogramma* parasites were released increased to as great an extent as in the check plats. No relationship was evident between *Trichogramma* releases and increased yields. All results indicated, therefore, that releases of *T. minutum* are of no value in the control of the sugarcane borer in Louisiana.

Parasites of the birch leaf-mining sawfly *Phyllotoma nemorata*, P. B. DOWDEN (*U. S. Dept. Agr., Tech. Bul.* 757 (1941), pp. 56, figs. 26).—This pest became abundant in Maine in 1926 and is still plentiful in several areas. There is but one generation a year. It overwinters as a prepupa within a lens-shaped hibernaculum spun inside the larval mine. There are several native parasites that attack this insect, and at times birds serve as important predators. *P. nemorata* is present in many European countries, but a severe infestation has never been reported. Material was collected in Ostmark and southern Bohemia by workers in the Bureau of Entomology from 1930 through 1934 in an effort to obtain beneficial parasites for liberation in this country. Parasitization was generally low in two general areas at 48 collecting points, but about 20 parasitic species were reared. Five were liberated in the United States. Two of the most important parasites of this insect in Europe (*Chrysocentris larinellae* (Ratz.) and *Phanomeris phyllotomae* Mues.) have become established in Maine.

The biology and immature stages of the following parasites were studied: *P. phyllotomae*, *Epiurus foliae* (Cush.), *Agrothereutes pygoleucus* (Grav.), *Tranosema pedicella* (Hlmgr.), *Sympiesis* sp., *Psigallo cruciatus* (Ratz.), *Tetrastichus xanthops* (Ratz.), *Hemiptarsenus anementus* (Walk.), *Cirrospilus pictus* (Nees), *C. vittatus* (Walk.), *Chrysocharis laricinetellae*, and *Chrysocharis* sp.

Various methods of rearing were used, and many of the chalcidoid parasites were reared on *Fenusa ulmi*, an introduced pest of elms.

Western hemlock sawfly (*Neodiprion tsugae* Middleton) and its parasites in Oregon, R. L. FURNESS and P. B. DOWDEN. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 46-52).—Studies of its biology during an extensive outbreak of the hemlock sawfly near Sweet Home, Oreg., from 1933 to 1936, inclusive, and observations of the life history and habits of parasites that were reared from its cocoons are reported. There was found to be a single generation a year in Oregon. The adults emerge and deposit their eggs in hemlock needles early in the fall, and the winter is spent in the egg stage. The eggs hatch early in July, and the larvae complete their development and spin their cocoons in August or September. Most of the cocoons are spun in the forest litter, but a few are fastened to foliage. A small proportion of the population overwinters as prepupal larvae in cocoons. Since the larvae feed chiefly on old foliage, but few trees die. Parasites emerged from about 39 percent of the large collections of cocoons made during 1935 and 1936, but dissections showed that about 61 percent of the contained sawfly larvae had been killed by parasites in 1936. "Twenty different species of primary parasites and hyperparasites emerged. *Itoplectis montana* was one of the most important species reared in 1935, when the majority of the cocoons were collected on the foliage. *Exenterus tsugae*, *Aptesis (Pezoporos) tsugae*, *Stylocryptus subclavatus*, and *Tritneptis klugii* were more important in 1936, when the majority of the cocoons were collected from the forest litter. *Delomerista diprionis* was one of the most important species both years. *I. montana* was liberated at two points in Connecticut, one in Massachusetts, and one in New York where there were infestations of *Diprion polytomum*. *Delomerista diprionis* was liberated at three *Diprion polytomum* infestations—two in Connecticut and one in New York—and at one *Neodiprion sertifer* infestation in New Jersey."

Control of Pacific mite and European red mite on apples, J. B. MOORE, C. B. GNADINGER, R. W. COULTER, and C. C. FOX (*Jour. Econ. Ent.*, 34 (1941), No. 1, pp. 111-116).—The lack of a satisfactory method of controlling the Pacific mite and the European red mite on apples in Washington led to experiments with Selocide, a material first introduced for mite control in 1931. This insecticide is made by dissolving selenium in potassium ammonium sulfide solution and has been used for control of mites on grapes and citrus fruits since 1932. The findings have led to the conclusion that it affords an efficient control for these two mites and their eggs on apples, and that when properly used it causes no injury to fruit or trees. "Apples from an orchard sprayed with Selocide equivalent to 3 years' spray schedule contained no more selenium than did apples from orchards which had never been sprayed with Selocide. Comparisons of washed and unwashed apples from orchards sprayed with Selocide indicate that washing to remove selenium residue is not necessary. The amount of selenium added to the soil by one application of Selocide each year is negligible. Apples contain about the same amount of selenium as do California citrus fruits and grapes. This is true of fruit sprayed with Selocide and fruit not so sprayed. Selocide is compatible with cryolite, pyrethrum, and nicotine. It is not compatible with lead arsenate but can be used in a lead arsenate spray program under certain conditions."

ANIMAL PRODUCTION

[Experiments with production of livestock and poultry by the Hawaii Station] (*Hawaii Sta. Rpt. 1940, pp. 18-20, 27-31, 83-84, figs. 2*).—The results briefly presented include investigations by L. A. Henke, S. H. Work, Tsubota, Blake, L. E. Weaver, and Kong on pen fattening of beef cattle on rations of cane tops, bagasse, molasses, and soybean meal; analyses and digestibility of Guinea grass, molasses grass, and *Desmanthus virgatus*; cane molasses yeast as a replacement for part or all of the protein of soybean and tuna fish meals for swine; pineapple sirup and cane molasses compared for growing chicks and fattening pigs; cooked taro and papaya for fattening pigs; pineapple bran and a yeast-fermented mash in laying rations; relation of temperature and moisture to incubation of Muscovy duck eggs; and construction of a home-made egg cooler.

[Investigations in livestock production by the Iowa Station] (*Iowa Sta. Rpt. 1940, pt. 1, pp. 108-112, 114-115, 118-122, 124-125, 128-130, figs. 2*).—Results are reported on the progress of studies by B. H. Thomas, C. C. Culbertson, L. Yoder, J. A. Schulz, F. J. Beard, S. H. McNutt, H. L. Wilcke, P. S. Shearer, A. B. Caine, M. D. Helser, P. M. Nelson, G. F. Stewart, A. J. G. Maw, B. Lowe, and C. D. Lee on N, Ca, and P balances of draft horses during rest and work, production and role of sterols in rat and chick nutrition, use of rats for studying the relation of food to character of body fat, relation of vitamin E to reproduction of swine and sheep, production of eggs uniformly rich in vitamin D, vitamin E content of livestock and poultry feeds, factors in linseed meal or linseed oil responsible for finish on fattening yearling steers, growth and development of colts, influence of soybeans and soybean products on the quality of pork and keeping qualities of lard, beef and pork held in low-temperature storage for different intervals, effect of the ration and fattening period upon gains and quality of market poultry, the maintenance of quality in infertile eggs, factors influencing the quality of dried egg albumen, post-mortem changes in poultry carcass, and specificity of wheat-germ oil as a supplement to poultry rations.

[Feeding experiments with steers and sheep and studies with poultry by the Maryland Station] (*Maryland Sta. Rpt. 1940, pp. 32-34, 38-39, 66-67, 71-74, figs. 2*).—Brief results of experiments include the feeding value of distillers' rye dried grains for beef steers and ewes; efficiency in the utilization of feed by purebred and crossbred chickens; vitamin A requirement for hatchability, livability, and chick growth; vitamin A deficiency in commercial poultry and vitamin A storage in the chick; generalized edema in chicks prevented by vitamin E; feeding value for poultry of an industrial alcohol byproduct; candling as an indication of interior egg quality, and influence of *Escherichia coli* on the quality of frozen egg products.

[Investigations on livestock production by the New Mexico Station] (*New Mexico Sta. Rpt. 1940, pp. 35-41, 80-81, figs. 2*).—Reports of progress of studies include the carrying capacity of ranges and the clipping of range grasses, Ca and inorganic P in the blood of range cattle, the use of alfalfa hay for fattening cattle, comparison of rams and ewes of different breeds and characteristics for wool and lamb production in range sheep, battery cages v. pen management of laying hens, and inherent differences between families of hens selected for superior egg albumen.

[Range conservation practices for the Great Plains, B. W. ALLEN] (*U. S. Dept. Agr., Misc. Pub. 410 (1940), pp. 21, figs. 9*).—The more approved methods for the preservation, stocking, and grazing of the range to promote optimum

conditions of ranges in the Great Plains area and, at the same time, to obtain maximum returns from livestock carried are reviewed.

Further studies on the amino acid deficiencies of plant proteins, J. S. C. MARAIS and D. B. SMUTS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 14 (1940), No. 1-2, pp. 387-402).—Continuing previous studies (E. S. R., 82, p. 370), the authors report that sesame meal supplemented with 0.2 percent of cystine showed improved gains in rats and better utilization of the N in the balance experiments. On the other hand, no significant improvement was induced in utilization of cottonseed meal by supplementing it with cystine or from supplementing bran and copra meal with lysine, peanut meal with methionine, or soybeans and linseed meal with tryptophan.

Development and cure of "ring-tailed" condition in rats on vitamin B₆ deficient diets, L. W. McELROY and H. GOSS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 717-719, fig. 1).—Ringlike lesions appearing on the tails of rats on a B₆-deficient diet for from 5 to 6 weeks of age were first aggravated when supplements of 3 and 10 µg. of synthetic B₆ were furnished, but continuing the supplements further cured the condition and improved the dermatitis of the face, ears, and paws. The same sequence of conditions occurred when supplements of the dry rumen contents from cattle and sheep were furnished (E. S. R., 85, p. 94).

Digestibility of nutrients in four varieties of sweetclover hay, J. SOTOLA. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 12, pp. 887-891).—In digestive experiments with lambs (E. S. R., 71, p. 78) the author found that the digestible protein and total digestible nutrients of eight samples of first- and second-year hay crops of Grundy County, Arctic, Common White, and Alpha 1 varieties ranged from 8.61 to 10.95 and from 41.94 to 50.25 percent, respectively. The nutrients of Alpha 1 and Grundy County White were as well digested in the first- as in the second-year hay crop. Second-year Arctic had a lower digestibility of dry matter, protein, N-free extract, and fat than did the first-year crop. First-year Common White was superior to the second-year crop because the protein and crude fat were better digested. When consideration is given to both digestible protein and total digestible nutrients, the ranking samples among those tested were first- and second-year Grundy County, first-year Arctic, and first-year Common White.

Some chemical changes occurring in molasses grass silage, C. B. BENDER, D. K. BOSSHARDT, and O. F. GARRETT. (N. J. Expt. Stas.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 147-151, fig. 1).—By means of borings through the silo wall, samples were taken from the same layer of oat and pea-molasses silage at frequent intervals up to 35 days after ensiling. Analyses of these samples showed a sharp rise in acetic acid content and a sharp decline in total sugar content and pH of the silage during the first 3 days and further changes of a related nature during the first week, after which time all of the values became relatively constant. The heterogeneous nature of the mass in the silo was indicated by certain of the data obtained.

Third annual report of the Arizona feed control office, year ending December 31, 1940, W. T. McGEORGE, E. O. FOSTER, A. M. KALAF, and H. VON COLBITZ (*Arizona Sta. Bul.* 172 (1941), pp. [1]+187-244).—In the usual manner (E. S. R., 83, p. 233) the guaranteed and found analyses of feeds inspected for the enforcement of the Arizona feed control law in 1940 are presented.

Some morphological and functional relationships of the bovine hypophysis, L. O. GILMORE, W. H. PETERSEN, and A. T. RASMUSSEN (*Minnesota Sta. Tech. Bul.* 145 (1941), pp. [1]+55, figs. 14).—The cytological structure of bovine hypophyses obtained from 139 ♀s and 62 ♂s from birth to 15 yr. of age is

described. The relationship between the weight and measurements of the gland was correlated with the weights and breeds of cattle from which they were taken and the milk production records.

Carotene and vitamin A in cattle blood plasma with observations on reproductive performance at restricted levels of carotene intake, R. E. DAVIS and L. L. MADSEN. (U. S. D. A.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 135-146, fig. 1).—Employing spectrophotometric methods of analysis of blood plasma for carotene and vitamin A previously noted (E. S. R., 81, p. 403), the authors found that beef heifers receiving from 30 to 45 μ g. of carotene per kilogram of body weight had from 34 to 58 μ g. of carotene and from 14 to 23 μ g. of vitamin A per 100 cc. of plasma. Dead, weak, or blind calves were produced by these heifers. Normal living calves were born to two heifers that received 60 μ g. of carotene per kilogram of body weight prior to and throughout gestation. The carotene was supplied from high-quality alfalfa leaf meal. Evidently, the vitamin A requirement is greater and higher plasma carotene and vitamin A levels are needed for normal reproduction than for the prevention of symptoms of deficiency. Larger amounts of carotene in the ration up to 120 μ g. per kilogram of live weight increased the plasma carotene and vitamin A, but this increase was relatively less than below the 60- μ g. level.

The utilization by calves of energy in rations containing different percentages of protein and in glucose supplements, H. H. MITCHELL, T. S. HAMILTON, and W. T. HAINES. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 12, pp. 847-864).—The utilization of metabolizable energy in the rations of four steer calves was not significantly modified by variations in the protein level between 6 and 20 percent. Apparently, the feed energy was utilized for fattening as efficiently as for growth. No specific dynamic effect was noted from additions of glucose, but there was depletion in the digestibility of celluloses and hemicelluloses that depend on the fermentative action of micro-organisms in the paunch. The production of methane was not increased. Because of the apparent associative effect between glucose and the insoluble carbohydrates, estimations of the metabolizability of the gross energy of the glucose supplements were lower than the true values. About half of the metabolizable energy of glucose supplements to the basal ration was wasted. There were 32 collection periods for metabolizable energy and 52 tests in the respiration chamber.

Relative efficiency of different types of corn for fattening steers, C. C. CULBERTSON, P. S. SHEARER, and J. L. ROBINSON (*Iowa Sta. Rpt.* 1940, pt. 2, pp. 65-67).—A 210-day test with yearling cattle showed little difference in the fattening quality with different varieties of corn.

The dry matter consumption of sheep on natural grazing in the Transvaal, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 14 (1940), No. 1-2, pp. 403-413).—Employing the methods followed by Garrigus and Rusk (E. S. R., 75, p. 527), the authors found that the loss in weight of sheep on pasture in winter was due to the depletion of nutrients in the transfer from summer to winter grazing. The dry matter consumption was proportional to the $\frac{3}{4}$ power of the weight of the animal.

The utilization by sheep of the proteins contained in the natural grazing during different seasons of the year, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 14 (1940), No. 1-2, pp. 415-420).—The biological value of the protein of pasture grass was found to vary with the season. When the protein content was high in the spring and summer the biological value was low, whereas the lower protein content of the grass in winter was associated with a higher biological value. The low protein content of the pasture in winter produced a negative N balance in sheep employed in carrying out the experiments in the four seasons.

Iodine in the nutrition of sheep.—Final report, A. I. MALAN, P. J. DU TOIT, and J. W. GROENEWALD (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 14 (1940), No. 1-2, pp. 329-334, fig. 1).—In continuation of studies previously reported (*E. S. R.*, 76, p. 372; 78, p. 381) it was found that the daily administration of 0.05 gm. of potassium iodide in 12 cc. of water to 10 Merino ewes produced no significant benefit on body weights, regularity of reproduction, or mortality of the lambs as contrasted with results from ewes which received 12 cc. of water without the iodine. The basal ration consisted of yellow corn, blood meal, veld hay, and green feed.

Comparison of the wool and skins of full-fed and maintenance-fed lambs, M. X. SULLIVAN, W. C. HESS, and P. E. HOWE. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 12, pp. 877-886).—Comparative analyses of the wool and skins of nine pairs of wether lambs, one of each of which had been full fed and the other fed a maintenance ration of shelled corn, cottonseed meal, corn silage, and clover hay from October 1933 to February 1934, showed the skins from those on the full-feed ration to contain markedly more cystine and sulfur than their twins on the maintenance ration. The basic amino acids, histidine, lysine, and arginine were of essentially the same order of magnitude in the skins and wool from both twins of one pair tested.

Tissue ascorbic acid of the goat, M. S. RICHMOND, G. H. SATTERFIELD, C. D. GRINNELL, and W. J. DANN. (Univ. N. C. et al.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 44-48, figs. 2).—Continuing this investigation (*E. S. R.*, 84, p. 236), six goats maintained on a vitamin-free natural diet (mixed grain) inadequate for normal reproduction and lactation were studied with reference to the ascorbic acid content of the blood, milk, and certain tissues. After from 2 to 3 mo. on the diet blood ascorbic acid declined to about 0.4 percent, or approximately two-thirds the normal concentration. Tissue analyses showed a similar decrease in ascorbic acid concentration in the liver but not in the adrenal glands. There was an apparent decrease in total ascorbic acid in both the adrenals and the liver as a result of atrophy. There was a greater deposition of interperitoneal fat in the experimental animals than in the controls, although the former had apparently lost weight.

Pork production, H. O. WEST (*Mississippi Sta. Bul.* 351 (1940), pp. [1]+139, figs. 41).—A summary is given of selecting and judging hogs of different breeds and types, the diseases and parasites found to occur in swine, housing and equipment, killing, and curing and storing of pork. Results of numerous experiments bearing on these subjects are compiled.

Soybean oil meal for pigs, V. A. FREEMAN (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 179-180).—Heat-treated soybean meal (expeller and roasted solvent) proved more palatable to pigs and was more efficiently utilized than raw solvent meal. It produced practically as good gains as tankage when fed with corn, barley, and alfalfa.

Digestible nutrients of feeding stuffs for the domestic rabbit, L. VOIS, L. F. MARCY, E. J. THACKER, and W. W. WAINIO. (Pa. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 9, pp. 673-683).—The composition, digestibility, and digestible nutrients for rabbits of 47 feeding stuffs, including dry roughages, green roughages, roots, tubers, concentrates, and commercial mixed feeds, are reported. Concentrates were well digested, and, with the exception of crude fiber, roughages were nearly as well digested as by domestic animals. Kale, alfalfa, vetch, clover, soybeans, wheat, and Sudan grass were found to be among the better roughages for rabbits, whereas bluegrass and oat hay were the poorest roughages for this purpose. Cottonseed cake was toxic to rabbits when fed as the sole concentrate. Soybean hay prevented the loss of appetite

associated with cottonseed feeding, but the rabbits died. Other investigations on the utilization of feeding stuffs by rabbits are summarized.

The water consumption of hens, B. W. HEYWANG. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 184-187).—Water consumption of White Leghorn and Rhode Island Red hens on an all-mash ration at Glendale, Ariz., for an entire year averaged about 18 and 20 gal., respectively. Increases in water consumption were associated with increased air temperature, live weight, and rate of egg production, while decreases in water consumption were associated with decreases in these three factors.

A comparison of a pelleted and unpelleted all-mash diet for laying chickens, R. B. MORGAN and B. W. HEYWANG. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 62-65).—In two experiments of approximately 1 yr. each, 134 and 200 pullets, respectively, were fed on a suitable all-mash laying ration. One-half of the birds received the ration in the pellet form, whereas the other half received it as mash. In both years the egg production of pullets receiving pellets slightly exceeded production on the unpelleted diet. Feed consumption per bird was somewhat less on the pellets. Live weight of the birds on the pellet ration was statistically greater, but mortality was not appreciably different in the two lots.

Carrots used for green feed substitute [for poultry], J. G. WELLS, JR., and J. A. DAVIDSON (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 155-158).—Continuing the study previously noted (E. S. R., 81, p. 98), the authors found Chantenay yellow carrots to be a good source of carotene as compared with alfalfa leaf meal and Greenmelk feed.

The use of distillers' by-products in poultry rations, H. J. SLOAN. (Minn. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 83-96).—Distillers' grains were studied as substitutes for dried skim milk and other riboflavin sources for growing chicks and laying hens. The results showed that from 6 to 7 percent of special distillers' dried grains supplied ample riboflavin for growing chicks and laying hens. However, when from 22 to 30 percent of the ration of chicks was supplied from this feed, thus excluding meat scrap and soybean meal from the ration, inferior growth was produced. This result was presumed to be due to the inferior protein quality since the same total amount of protein from mixed sources produced satisfactory growth. The special distillers' dried grains satisfactorily comprised up to from 12 to 15 percent of the total crude protein in the rations. Distillers' dried solubles containing 25 to 30 μ g. of riboflavin per gram and comprising 5 percent of the ration produced growth comparable to that on rations with other feeds to which adequate riboflavin was added. These results are generally indicative of the satisfactory replacement of the riboflavin source and 12 percent of the total crude protein by distillers' dried solubles.

The riboflavin content of poultry feedstuffs, T. G. CULTON and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 3-6).—Assays for riboflavin by the microbiological method described by Snell and Strong (E. S. R., 82, p. 587) were conducted on approximately 50 samples of poultry feeds. The results showed that 10 samples of dried buttermilk averaged 72 percent higher in their riboflavin content than the 13 samples of dried skim milk, and the riboflavin content of 5 samples of dried whey ranged from 60 to 144 percent of the average for dried skim milk. There were no significant differences between the riboflavin content of samples of milk products prepared in different seasons of the year. The riboflavin content of brewers' yeast, meat scrap, fish meal, and alfalfa meal was included in the study.

The effect of diet on the pantothenic acid content of eggs, E. E. SNELL, E. ALINE, J. R. COUGH, and P. B. PEARSON. (Tex. Expt. Sta. et. al.). (*Jour.*

Nutr., 21 (1941), No. 2, pp. 201-205).—The pantothenic acid content of eggs was directly proportional to the amount in the ration. Four hens maintained from hatching on a ration which was so low in pantothenic acid as to cause typical dermatitis produced eggs containing 0.41 and 0.66 μg . of pantothenic acid per gram of white and yolk, respectively. Corresponding values for eggs from hens on a stock ration were 0.76 and 46.8 μg ., respectively. Supplementing the deficient ration with 8.4 μg . of *dl*-sodium pantothenate per 100 gm. of feed was immediately reflected in a continued increase in the pantothenic acid in both whites and yolks for about 18 days.

The provitamin D of the covering tissues of chickens, E. M. and F. C. KOCUR (*Poultry Sci.*, 20 (1941), No. 1, pp. 33-35).—Extracts of the feathers and preen glands of chicks gave negative results for the presence of provitamin D when injected in rats, but after irradiation of dried leg and body skin with a Cooper-Hewitt lamp 7.5 mg. was sufficient to produce a 2+ cure of rickets. Chemical studies confirmed the presence of provitamin D in the skin, and spectrographic examination showed the presence of ergosterol and 7-dehydro-cholesterol.

Rickets in laying pullets fed sulphur, C. E. HOLMES, J. G. HALPIN, and C. A. HERBICK. (Univ. Wis.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 46-50).—In a study of the influence of long-time feeding of sulfur, from 2 to 5 percent of flowers of sulfur and ground sulfur were added as supplements to a balanced ration to 5 lots of 50 chicks each and laying pullets from April 11, 1938, to July 1, 1939, without access to direct sunlight but with 1 percent of cod-liver oil in the ration. The pullets on the sulfur ration laid well until January. Later, production declined, shell texture became poorer, many of the pullets were down with egg paralysis, and hatchability of the fertile eggs was lowered. Those receiving the largest amounts of sulfur were the most seriously affected. These conditions were not observed in control groups, and there was rapid improvement in the treated groups after direct sunlight was administered and the sulfur feeding was stopped. Therefore, it seemed to be an unsound practice to feed from 2 to 5 percent of sulfur to laying pullets during the winter, when the potency of the sunlight was lessened.

The relation of total weight and the weight of the component parts of the egg to hatching power, H. M. SCOTT and D. C. WARREN. (Kans. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 75-78, figs. 3).—Study of the weights of the total egg, white, and yolk and the ratio between them in reference to hatchability of the eggs laid by two flocks of White Leghorns consisting of 172 and 181 birds each showed that too large and too small egg size both depressed hatchability. Eggs with a proportion of white to yolk of 2 : 1 had a better chance to hatch than eggs with wider or narrower ratios.

The effect of cottonseed oil on the hatchability of eggs, R. C. RINGROSE, C. L. MORGAN, and E. J. LEASE. (S. C. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 57-61).—Since varying hatching results were obtained on rations containing cottonseed meal of different oil contents, studies were made of the relation of different cottonseed products to hatchability on a control ration. In the different experiments, hatchability between 75 and 85 percent on the control ration was reduced to 27.8 percent by the addition of 3.6 percent of crude cottonseed oil. The saponifiable fraction of this amount of cottonseed oil reduced hatchability to 67.6 percent. In further experiments, neither soybean oil, Wesson oil, nor hydrogenated cottonseed oil depressed hatchability. The deleterious influence in cottonseed oil was not removed by heating or oxidation, since the product remaining after such treatment lowered hatchability to from 20 to 30 percent, and the impurities from the refinement of

3.6 percent oil lowered hatchability to about 60 percent. The unfavorable effects of cottonseed oil on hatchability were evidently not due to the fat or corrected by vitamins A, D, and E or pork liver supplements.

Effect of date of hatch on egg weight, F. P. JEFFERY. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 7-13, fig. 1).—Comparative study of the weights of eggs laid by groups of White Leghorns hatched in June, September, and November 1937 and January and April 1938 showed that egg weight was the result of the interaction between age, temperature, body size, and rate of production. On account of these effects, and especially that of temperature, it seems certain that the same strain might give different results in different localities. High temperatures tended to reduce egg size after body maturity was reached to such an extent that in some instances small birds produced larger eggs than large birds of the same age and breeding when below-normal temperature prevailed for the former and above-normal for the latter. January- and April-hatched pullets produced a high percentage of large eggs, but the November- and January-hatched birds produced more pullet and peewee eggs than birds hatched in the other season. A high percentage of medium eggs was produced by the pullets hatched in June and September. The study was based on the weights of eggs laid in 13-week intervals up to 76 weeks of age by pullets hatched during the five periods.

Quality of frozen poultry as affected by storage and other conditions, H. M. HARSEHAW, W. S. HALE, T. L. SWENSON, L. M. ALEXANDER, and R. R. SLOCUM (U. S. Dept. Agr., Tech. Bul. 768 (1941), pp. 20).—In a study with Barded Plymouth Rock and Buff Orpington cockerels, with one-half of the group drawn and the others undrawn and all stored for 1, 2, and 3 yr. at 0° and -20° F., it was concluded that temperatures as low as -20° were more favorable in maintaining quality, as judged by external appearance and palatability. Drawing had less effect on the palatability of the thigh meat during customary periods of storage, but during prolonged periods undrawn birds developed an unfavorable aroma. Storage at 0° resulted in a greater loss of weight and deterioration of external appearance, chemical changes, and bacterial counts than storage at the lower temperature. Changes in the chemical composition were not greatly affected, but there was a tendency with aging for an increase in the glucose in the muscle tissue and the acidity of the intraperitoneal fat with the development of rancidity. Considerable numbers of bacteria remained viable in the muscle tissue after 3 yr. of storage. Those birds weighing under 5.5 lb. required relatively little time for cooking and lost relatively less weight in cooking than the heavier birds. The birds stored at the lower temperature were generally rated superior in palatability after 3 yr. in storage, but differences in flavor were not significant in the first year's test.

Boning, curing, and smoking poultry meat, P. J. SCHAEFER and J. A. DAVIDSON. (Mich. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 4, pp. 228-230, 255-256).—Procedures are suggested.

Turkey rations and feeding methods, G. C. CRANDALL (*New Jersey Stas. Hints to Poultrymen*, 28 (1940), No. 1, pp. [4], fig. 1).—Rations and methods of feeding poults and growing and breeding turkeys are described.

DAIRY FARMING—DAIRYING

Proceedings [of the] twenty-sixth annual meeting, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc. West. Div., Proc. Ann. Mtg.*, 26 (1940), pp. [3]+74, fig. 1).—The following papers are published in full for the meetings held at Portland, Oreg., on October 6, 1940

(E. S. R., 83, p. 301): Preliminary Observations on Methods of Determining the Degree of Homogenization of Market Milk, by G. F. Steel (pp. 12-16); Staining Fat Globules With Nile Blue Sulfate, by W. C. Cole and F. R. Smith (pp. 17-19) (Univ. Calif.); The Use of Frozen Utah Fruits in Ice Cream, by A. J. Morris (pp. 20-24) (Utah State Agr. Col.); The Oregon Method for Controlling Moisture and Fat in Butter, by G. H. Wilster and R. E. Stout (pp. 25-30) (Oreg. State Col.); A Comparison of the Suggested Methods of Analysis for the Milk Fat in Skim Milk, by H. C. Hanson and D. D. Deane (pp. 31-38) (Univ. Idaho); The Accuracy of Certain Methods and Procedures in the Sampling, Preserving, and Testing of Milk Received at Milk Plants, by G. H. Wilster and R. P. Robichaux (pp. 39-43) (Oreg. State Col.); Blue Veined Cheese (Roquefort Type) Ripened in Cans Under Gas Controlled Conditions, by N. S. Golding (pp. 44-47) (Wash. State Col.); Progress Report Relating to the Control and Treatment of Mastitis in Dairy Cattle, by D. L. Fourt and F. C. Fountaine (pp. 48-52) (Univ. Idaho); Relation of All-hay and Hay-grain Rations to Nutrient Requirements of Dairy Cows, by F. B. Headley (pp. 53-57) (Nev. Expt. Sta.); The Efficiency of Conversion of Feed Energy Into Milk Energy by Dairy Cows on Various Rations, by I. R. Jones and V. R. Smith (pp. 58-63) (Oreg. State Col.); Comparing Cows Which Have Completed Different Numbers of Lactation Records, by J. C. Berry (pp. 64-71); and The Digestibility of Corn Silage and Mixed Hay as Determined by Dairy Cattle and Sheep, by F. B. Wolberg, R. E. Hodgson, J. C. Knott, and U. S. Ashworth (pp. 72-74) (West. Wash. Sta. and U. S. D. A.).

[Experiments with dairy cattle in Hawaii] (*Hawaii Sta. Rpt. 1940, pp. 20-27, fig. 1*).—Results are briefly reported for the following lines of investigation by L. A. Henke, S. H. Work, and C. I. Maruyama: A comparison of roughages for dairy cattle, including Rhodes grass v. Sudan grass, whole Napier v. cut Napier grass, and guinea grass, Mexican grass, and *Desmodium virgatus* each v. Napier grass; cottonseed v. soybean meal as protein supplements in dairy rations; high v. low fat in the dairy ration; the value of cane molasses yeast as a source of protein for milking cows and growing heifers; and urea as a protein substitute in the ration of heifers.

[Investigations with dairy cattle and dairy products] (*Iowa Sta. Rpt. 1940, pt. 1, pp. 105-106, 115-118, 154-170, figs. 6*).—Progress reports (E. S. R., 82, p. 810) of experiments with dairy cattle, by J. L. Lush, C. Y. Cannon, D. L. Espe, B. H. Thomas, J. A. Schulz, and E. N. Hansen, include the persistency and inheritance of milk and fat production among cows in Iowa cow-testing associations, the relation of vitamin E to sterility in dairy cows, the influence of the physical properties of milk on its rate of digestion in vivo, and a comparison of roughages and the relation of roughage to grain in the dairy cow ration.

Records of investigations with dairy products not previously noted include phosphatase production by various micro-organisms, relationship of organisms to the disappearance of rancidity in Cheddar cheese, the development of butter cultures from mixtures of organisms, methods of preparing butter cultures for mail shipment, flavor in ripened unsalted butter, diacetyl and acetylmethylcarbinol in sweet cream, the use of a photoelectric colorimeter for the determination of diacetyl and acetylmethylcarbinol, and salt distribution in butter on a micro basis, all by B. W. Hammer; the mechanism of the dissimilation of the carbon sources in butter and cheese cultures, by Hammer and C. H. Werkman; the bacteriology and enzymology of ripening of hard cheeses, by C. B. Lane and Hammer; the kinds of acid in butter and the distribution of these acids between the water and fat phases of butter, and the effect of neutralizers on

the fat losses in buttermilk and the quality of the butter, both by E. W. Bird; and standardization of Iowa dairy products, by M. Mortensen.

[Experiments with dairy cattle and dairy products in Maryland] (*Maryland Sta. Rpt. 1940*, pp. 32, 34-35).—Brief progress reports (E. S. R., 82, p. 810) are presented for the following investigations: Input as related to output in milk production, the value of adding kelp meal to the rations of dairy animals, the use of annatto as a tracer in cream for manufacturing purposes and its detection, and the effect of weather variations on the retail sale of ice cream.

[Dairy investigations in New Mexico] (*New Mexico Sta. Rpt. 1940*, pp. 59-61, 62).—Progress reports are presented on the value of Sudan grass pasture and cornstarch as a supplement to cottonseed meal and hegari fodder for the prevention of blindness and edema in dairy cattle and goats, the potency of the "grass juice" factor in the milk of animals so fed, and the improvement of milk goats through breeding.

[Progress of dairy research in Scotland] (*Hannah Dairy Res. Inst., Ann. Rpts.*, 10 (1939), pp. 19; 11 (1940), pp. 20, pls. 4).—Studies for which results are briefly reported (E. S. R., 80, p. 675) include for both 1939 and 1940 the protein requirements of dairy cows, the importance of home-produced feeding stuffs, contagious bovine abortion, bovine mastitis, the bacteriology of canned milk products and of spray-dried milk powders, and the keeping quality and solubility of milk powders; for 1939 the biochemistry of milk secretion, the genetics of dairy cattle, and crop and stock husbandry; and, for 1940, investigations into self-sufficiency, the storage of feeding stuffs, lactation, the bacteriological control of milk, the design of a small-scale drying plant, and the utilization of milk byproducts.

Judging dairy cattle on the basis of type and records of production, W. W. SWETT and R. R. GRAVES (*U. S. Dept. Agr., Misc. Pub. 409* (1941), pp. 29, pl. 1).—The plan outlined in this publication provides for equal weight to be given to the cow's type and to her demonstrated capacity for production in determining the final placing. A plan for judging cows by groups, a plan for judging sires based on the type and production of their daughters, and the application of the type-and-production plan to judging contests are each fully discussed.

A study of change in conformation and type in dairy cow development, G. Q. BATEMAN (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 1, p. 9, figs. 6).—A photographic record indicating changes in conformation with advancing age of a Holstein female and a brief discussion of the subject are presented.

The evaluation of dairy sires in New Zealand, A. H. WARD and J. T. CAMPBELL (*Empire Jour. Expt. Agr.*, 8 (1940), No. 32, pp. 249-258).—The methods of compiling and issuing sire-surveys in New Zealand are outlined. An analysis of the dam-daughter records of 41 sires showed an average regression of daughter record on dam record of +0.1433. It is the authors' opinion that the average production of all daughters is a better approximation of the bull's probable breeding value than the parent intermediate index. Preference is expressed for using the average of all production records of an individual rather than a single selected record.

The time of ovulation in cattle, J. E. BREWSTER and C. L. COLE. (Mich. State Col.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 111-115, fig. 1).—By rectal palpation of the ovaries, the time of ovulation following the end of oestrus was determined in 73 oestrous periods of 47 cows. In practically all cases ovulation occurred within the first day after the end of oestrus, the average time being 13.57 hr. and 67 percent of the ovulations occurring between 8 and 16 hr. after the end of oestrus. Follicles were produced with equal frequency

by the two ovaries, and neither time of day nor breed and type of animal had any influence on the time of ovulation. Heifers required an average of 3.04 hr. less time to ovulate than cows which had previously calved.

Body size and milk production, M. KLEIBER and S. W. MEAD. (Univ. Calif.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 127-134).—This is a critique of reports by Gaines (E. S. R., 82, p. 670; 83, p. 392), in which the authors present data to support the theory that the capacity for milk production in cows is proportional to their rate of metabolism or in turn to the three-fourths power of their body weight. The desirability of using a relative lactation capacity instead of absolute yields as a criterion for selection of breeding dairy cows is discussed.

Milk yield and fat content.—I, A study of the relationship between daily milk yield and the fat content of the milk of lowland breeds of cattle [trans. title], E. LAUPRECHT and H. DÖRING (*Jour. Landw.*, 88 (1940), No. 1, pp. 64-78, figs. 6).—It is shown that the relationship between daily milk yield and fat percentage is expressed by a hyperbolic curve which is essentially of the same form for the various areas and breeds included in this study. Milk yield bore a straight-line relationship to fat yield. Constants derived for expressing the above relationships are presented.

Studies on influencing milk fat production with minerals [trans. title], J. KŘÍŽENECKÝ (*Biedermanns Zentbl., Abt. B, Tierernähr.*, 12 (1940), No. 3-4, pp. 368-394, figs. 15).—The results of three separate trials confirm the findings of Black and Voris (E. S. R., 71, p. 833) of a positive correlation between the fat content and the contents of calcium, magnesium, and phosphorus in milk. Greater economy of feed utilization for milk secretion was brought about by increasing the intake of these minerals by the animal. The nature of the specific influence of these elements on the metabolism of the mammary gland is discussed.

A comparative feeding trial to test the relative values of early and late cut hay for dairy cows [trans. title], E. BROUWER and N. D. DIJKSTRA ([Netherlands] Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek., No. 45 (25) C (1939), pp. 763-805, figs. 3; Eng., Ger. abs., pp. 802-805).—The early-cut hay averaged from 3 to 4 percent higher in crude protein and from 1 to 8 percent lower in crude fiber than late-cut hay from the same fields. The coefficient of digestibility of the dry matter in the early-cut hay averaged from 1 to 3 percent higher than in the late-cut hay, although there was no significant difference in the digestibility of true protein in the two lots. In comparison with the green forage the digestible protein of the cured hay was about three-fourths of the original value and the starch value about two-thirds of the original. In feeding trials a larger quantity (1.8 kg. per head daily) of the early-cut hay was consumed, with the consequence that about 1.5 kg. less concentrates per head daily were required to maintain the same level of milk production as in the group fed late-cut hay. The quality of the hay had no significant effect on the composition of the milk or the iodine value of the butterfat.

Feeding alfalfa hay alone and with concentrates to dairy cows, D. H. SHEPWOOD and H. K. DEAN (*Oregon Sta. Bul.* 380 (1940), pp. 35, figs. 4).—The experiments described extended over four lactation periods with two groups of cows, one of which was fed only alfalfa hay and the other alfalfa hay plus a limited amount of concentrates. Some pasture was available to both groups during the last 2 yr. of the experiment. The average milk production per lactation period (approximately 300 days) was 4,192 and 5,358 lb., the average butterfat production was 238.3 and 294.0 lb., and the pounds of total digestible nutrients required per pound of butterfat produced were 18.2 and 17.2 (13.9 from hay and 3.3 from concentrates) for the hay-fed and the hay-concentrate-fed groups, re-

spectively. The solids-not-fat averaged slightly higher in the milk from the hay-fed group. Cows in both groups were heavier at the end of 12 mo. after freshening than at freshening time, with those fed hay and concentrates averaging slightly heavier than those fed only hay. The feeding methods had no apparent detrimental effect on the health of the herd, and both groups had excellent reproductive records. Both groups averaged somewhat below normal in the inorganic phosphorus content of the blood. Tables are presented indicating the margin over feed costs for both methods of feeding at various prices for feed and butterfat.

Alfalfa silage preservation, B. C. JOHNSON, W. H. PETERSON, W. A. KING, and G. BOHSTEDT. (Wis. Expt. Sta.). (*Indus. and Engin. Chem.*, 32 (1940), No. 12, pp. 1622-1625, figs. 2).—During 3 yr. alfalfa silages containing 20-30 lb. of phosphoric acid per ton and those receiving 65 lb. of molasses per ton were similar in quality as adjudged by the color, odor, and chemical analyses. Those containing 8-15 lb. of phosphoric acid per ton were of poorer quality and showed greater carotene losses and a higher percentage of ammonia nitrogen than those receiving larger amounts of phosphoric acid. All lots were reasonably palatable to dairy cows, and no significant differences were noted in milk production or flavor of the milk when different lots were fed. The carotene and vitamin A present in milk produced on the molasses and high phosphoric acid silages exceeded the average for Wisconsin winter market milk, while the low phosphoric acid silages resulted in milk within the same range as average winter milk.

The nutritive value of chicory tops for dairy cattle, C. F. HUFFMAN, L. BUTLER, and E. J. MILLER (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 172-174).—The chicory tops studied were characterized by a relatively high ash content (high in calcium and magnesium, but low in phosphorus) and low crude fiber content. In trials with cows the following coefficients of digestibility were obtained: Dry matter 63.4 percent, organic matter 68, crude protein 55.1, ether extract 9.1, crude fiber 57.6, and nitrogen-free extract 77.5 percent. They contained 57 lb. of total digestible nutrients per 100 lb. of dry matter. After becoming accustomed to eating the chicory tops the cows consumed about 25 percent less tops than alfalfa hay, maximum consumption reaching 35 lb. per cow daily. The specific effect of feeding the dried tops on milk production was not determined, but the flavor of milk was not altered by their presence in the ration nor was the consistency of the feces appreciably affected.

The feeding value and nutritive properties of citrus by-products.—II, Dried grapefruit pulp for milk production, P. T. D. ARNOLD, R. B. BECKER, and W. M. NEAL (*Florida Sta. Bul.* 354 (1941), pp. 14, figs. 3).—Continuing this series (E. S. R., 73, p. 95), dried grapefruit pulp was found to be palatable to dairy cows, even after they had received their full regular feed. The dried pulp had an average weight of 0.71 lb. per quart and the dried grapefruit meal 0.97 lb. In a series of double reversal feeding trials with milking cows grapefruit pulp containing 1.2 percent digestible crude protein and 76.0 percent total digestible nutrients was compared with dried beet pulp when each constituted 40 percent of the total digestible nutrients consumed. In each of the three trials slightly more milk and butterfat were produced when grapefruit pulp was fed, while feed consumption and body weight of the cows was slightly greater when beet pulp was fed. Apparently these two byproduct feeds are practically equal in feeding value as bulky carbohydrate feeds for dairy cows. No undesirable flavors were imparted to milk by the dried grapefruit pulp.

Cerebrospinal fluid pressure and vitamin A deficiency, L. A. MOORE and J. F. SYKES. (Mich. Expt. Sta.). (*Amer. Jour. Physiol.*, 130 (1940), No. 4, pp. 684-689).—Supplementing previously reported studies (E. S. R., 82, p. 233),

with Holstein calves maintained on vitamin A-deficient rations, it was that such a deficiency results in an increased cerebrospinal pressure, accompanied by papilledema, nyctalopia, syncope, and incoordination. The cerebrospinal pressure slowly returned to normal and the other disorders appeared when an adequate supply of vitamin A was again added to the ration.

Influence of the feed of the cows on the contamination of milk by butyric acid bacteria [trans. title], J. VAN BEYNUM and J. W. PETTE (Netherlands) *Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek*, No. 46 (9) (1940), pp. 397-407, pls. 2; *Ger., Eng. abs.*, pp. 405-407).—Applying the test on page 243 to farm milks, it was found that butyric acid bacteria were not or present in very small numbers in milk when hay or artificially dried silage was fed or when cows were on pasture. When silage containing butyric acid bacteria was fed the feces of the animals contained large numbers of organisms, and a strong positive test for these organisms in the milk resulted. When hay replaced silage in the ration the number of milk samples containing butyric acid bacteria steadily declined and reached zero after about 3 weeks. The milk from a group of cows fed hay was slightly contaminated with butyric acid bacteria when another group receiving silage was housed in the same stable.

Dairy profit, W. J. FRASER (Danville, Ill.: *Interstate*, 1940, pp. 270, 271, figs. 141).—A practical treatise stressing the vital part played by proper management of factors in profitable dairy production.

A technique for perfusing excised bovine mammary glands, W. E. FRASER, J. C. SHAW, and M. B. VISSCHER. (Minn. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 139-146, figs. 2).—The apparatus described provided for the oxygenation, temperature control, and pulsating circulation of blood through the excised mammary gland. Directions are given for excising and caring for the excised gland, taking of the blood, the use of anticoagulants, and caring for the blood. The addition of various nutrients to the blood and other considerations in conducting a perfusion experiment are discussed.

Milking methods: A comparison, W. J. PARK (Queensland Agr. Jour., 1940, No. 5, pp. 367-369).—Application of the methylene blue reduction test to 814 samples of milk which had been held overnight on the production line at prevailing summer evening temperatures indicated that 65.7 percent of the samples produced with machine milking in conjunction with steam sterilization, 42 percent of those by hand milking without steam sterilization, and 23.4 percent of those by machine milking without adequate washing and sterilization facilities were of satisfactory quality.

A supplemental note on the correlation between fat percentage and yield of milk, milk fat, milk energy, W. L. GAINES. (Ill. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 159-164).—Supplementing an earlier record (E. S. 83, p. 539), formulas are presented for determining the coefficient of correlation between any two of the variables, fat percentage (f), milk yield (M), fat yield (F), and milk-energy yield (FCM), entirely in terms of f and M .

Some factors affecting the stability of certain milk properties, I. J. L. (N. J. Expt. Stas.). (*Jour. Dairy Sci.*, 24 (1941), Nos. 1, pp. 71-83, figs. 1, 2, pp. 103-109, fig. 1).—Two additional papers are presented in this series (E. S. 82, p. 673).

IV. A comparison of seven different roughages on the color and flavor of milk, O. F. Garrett, R. B. Arnold, and G. H. Hartman.—The color and flavor of milk and its resistance to oxidized flavor development were determined. Legume or grass silage was the primary roughage fed, the milk produced had a higher yellow color, finer flavor, and greater resistance to oxidized flavor.

corn silage, beet pulp, or citrus pulp was fed. Alfalfa silage was almost to spring pasture in imparting yellow color and was equal to or better pasture in producing fine-flavored milk resistant to oxidized flavor. Beet and citrus pulp had about the same effect on milk as measured by the criteria, except that a bitter flavor frequently appeared in milk when the pulp was fed. No significant difference in the effect of molasses-grass and phosphoric acid-grass silage on the measured characteristics of milk noted.

Interrelation of certain metals and metallic ions and the development of red flavor in milk, O. F. GARRETT.—The addition of divalent manganese to contaminated with copper or iron completely inhibited or greatly retarded development of oxidized flavor, and metallic manganese exerted a similar. Neither the oxidation-reduction potential of the milk nor the rate of lactic acid destruction was affected by the presence of the divalent manganese. Hydrogen exerted no protective action against the development of coppered oxidized flavor.

Factors influencing the flavor of milk, P. F. SHEAF. (Cornell Univ.). *Plant Mo.*, 30 (1941), No. 2, pp. 31-34.—A general discussion.

Sampling, preserving, and testing milk, G. H. WILSTER and R. P. ROBINSON. *N. J. Sta. Bul.* 383 (1940), pp. 44, figs. 8.—The findings presented are based on 2,000 and 1,000 tests for fat in milk by the Babcock and Mojonnier methods, respectively. With each test slightly but consistently lower fat percentages were found in composite samples as compared with those obtained by the testing of the milk daily. Sampling milk from the receiving tank without previous stirring failed to give a representative sample. A mixing sampling device to be attached to the receiving tank is described. Mixing contents of the composite sample bottles daily and returning them promptly to the refrigerator after the daily addition of milk improved the accuracy of the composite sample test. Formalin was not superior to mercuric chloride in preserving composite samples, and the addition of saponin was of no aid in arresting the decrease in the fat percentage of the composite samples. Removing the test sample from the composite sample bottles at temperatures between 12° to 68° F. had little influence on the test, but higher temperatures increasingly lowered the butterfat percentage obtainable. Measurable differences in fat readings resulted from variations in the accuracy of graduation of the standard Babcock milk test bottles. Standardizing the strength, temperature, and amount of acid, centrifuging at a desirable speed, and tempering the test bottles in a water bath before reading were all necessary for most satisfactory results. It is concluded that "if the fat tests are carefully and properly made, small variations, over a period of time, will give an average which closely approaches the true value. Under these circumstances neither the seller nor the buyer of the milk will be favored."

Butyric acid bacteria test for milk and other substances [trans. title], A. N. BEYNUM and J. W. PETER. ([Netherlands] Dept. Econ. Zaken, Verslag. Onderzoek. No. 46 (8) C (1940), pp. 379-396, pl. 1, fig. 1; Ger., Eng. pp. 392-395).—In the fermentation test described, milk to be tested is sterilized to destroy non-spore-forming organisms, fortified with 0.5 percent rose, adjusted to a pH of about 5.5, and incubated under anaerobic conditions (by using liquid paraffin in tubes) for 3 days at 35°-40° C. The odor of butyric acid or butyl alcohol after incubation indicates a positive test. Differential tests for distinguishing between *Clostridium tyrobutyricum*, and *C. harodonticum* are also described.

The stainless steel gravity milk mixer, H. E. ROBERTS and J. W. BARTLETT. *N. J. Sta. Bul.* 688 (1941), pp. 3, figs. 4).—A practical device to be at-

tached to the receiving tank in milk plants which insures complete mixing of the milk is described and illustrated.

Homogenized milk, L. K. CROWE. (Univ. Nebr.). (*Milk Plant Mo.*, 30 (1941), No. 2, pp. 36, 38).—Certain precautions to be observed in the homogenization of milk are discussed.

A visual mold test for cream, and patron reaction to it, C. H. PARSONS (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 3, pp. 12-13, 56-59, fig. 1).—The reagent and equipment required for conducting this rapid and simple test are described. The value of the test in producer education is stressed.

The Oregon method of controlling moisture and fat in butter, G. H. WILSTER and R. E. STOUT (*Oregon Sta. Bul.* 376 (1940), pp. 23).—Supplementing earlier reports (*E. S. R.*, 75, p. 249), changes in the composition of Oregon butter from 1929 to 1939 as revealed by the analyses of several thousand samples of commercial butter are summarized. While there has been a tendency in recent years to produce butter more closely approaching the minimum legal butterfat content of 80 percent, 50.1 percent of the samples tested in 1939 contained above 80.5 percent fat. The problem of moisture control in butter is discussed at length, and a series of mathematical formulas is presented for calculating the amount of water required to standardize any given butter to a desired butterfat content.

The setting of butter [trans. title], H. MULDER ([*Netherlands*] *Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek.*, No. 45 (23) C (1939), pp. 649-678, figs. 4; *Eng. abs.*, pp. 676-678).—Studies were conducted on the role of crystallization of liquid fat in butter in determining its hardness. In butter prepared from cream cooled to a low temperature no crystallization of fat occurred in the butter, while in that prepared from moderately cooled cream crystallization of the fat occurred after working accompanied by a pronounced hardening of the butter. Reworking such butter resulted in lowering the hardness. The greater the quantity of undercooled liquid fat contained in the butter after working, the more easily the fat particles grew together. The setting of butter is described as an asymptotic process which continued over a considerable period of time, especially at low temperature. The hardest butter generally was obtained when the setting took place at 13° C.

Studies on the consistency of butter [trans. title], H. MULDER ([*Netherlands*] *Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek.*, No. 46 (2) C (1940), pp. 21-109, figs. 16; *Eng. abs.*, pp. 107-109).—Studies on the influence of the cooling of cream on the physical state of the fat indicated that when warm cream was cooled suddenly to 2° C. a larger percentage of fat passed into the solid state than when cooled slowly to the same temperature. Cooling cream to 8°, following pasteurization, and then raising to ripening temperature (19°), for a few hours and recooling to 2° resulted in less solid fat in the cream subsequently raised to churning temperature than in cream similarly handled except that after pasteurization the cream was immediately brought to 19°. Churning tests showed that the hardest butter (immediately after working) is obtained from cream which before churning contains the greatest amount of solid fat. The effects of the cooling of cream on churning time, fat content of buttermilk, the form of the fat granules, the consistency, color, and the nitrogen, water, and salt contents of the butter and sensitivity of the butter to variations in temperature are discussed.

The firmness of butter from sweet cream compared with that of butter made from sour cream [trans. title], H. MULDER ([*Netherlands*] *Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek.*, No. 46 (5) C (1940), pp. 305-312; *Eng. abs.*, p. 312).—Evidence is presented to indicate that the acidity of cream has little or no influence on the hardness of butter made from it. Apparent differ-

ences in hardness are attributed to a difference between the methods by which the ripened and unripened creams are worked into the butter.

Crumbliness and stickiness in butter: Physical and chemical properties of the milk test, G. H. WILSTER, I. R. JONES, and J. R. HAAG. (Oreg. Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 32 (1941), Nos. 1, pp. 14-16. 39, figs. 2; 2, pp. 16-18, 42-44, figs. 2; 3, pp. 20, 22, 24-25).—Studies were conducted on the influence of certain feeds and the effect of season of the year on the composition of the fat in butter and the chemical and physical properties of the fat of butter produced in the humid, semihumid, and arid sections of the State. When alfalfa hay was fed as the sole ration, the fat of the milk had a relatively high melting point and a low content of unsaturated and volatile fatty acids. Supplementing the alfalfa with grain tended to increase the volatile soluble fatty acids, but decreased the unsaturated fatty acids. The inclusion of artichokes in the ration or allowing cows access to pasture caused a distinct increase in the Reichert-Meissl number of the fat in all cases. Pasture also resulted in an increase in the iodine number and refractive index of the fat, while these values tended to be depressed by the feeding of artichokes. Certain breed differences in the character of milk fat are also described. Butter made in the areas of moderate to abundant rainfall generally had a medium-firm body and a satisfactory texture, while winter butter made in the arid alfalfa-producing sections had a firm body and generally showed stickiness or crumbliness, or both defects. The fat of such butters had lower Reichert-Meissl and Polenske values than that of butter from the more humid areas. It is suggested that inasmuch as the feeding of grain supplements with alfalfa hay does not materially change the physical and chemical properties of milk fat, the important and practical solution of the problem lies in the modification of present butter-making methods.

The thiocyanogen number of Dutch factory butter [trans. title], H. MULDER ([Netherlands] Dept. Econ. Zaken, Verslag. Landbouwk. Onderzoek., No. 46 (11) C (1940), pp. 439-448, figs. 2; Eng. abs., pp. 446-447; Ger. abs., p. 447).—Determinations on butters from 62 factories revealed a coefficient of correlation of 0.990 ± 0.003 between the iodine number and the thiocyanogen number of the fats. The thiocyanogen number could be closely estimated by the formula $0.8913 \times \text{iodine number} - 1.14$. Variations in the composition of fat in Dutch, Danish, and Finnish butters are reported.

Avenized versus standard parchment for wrapping print butter, W. B. COMBS, S. T. COULTER, and D. W. WHITMAN. (Minn. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 117-125).—Samples of butter ranging from 90 to 93 in initial score were wrapped in standard parchment and in Avenized parchment and reexamined for quality after 15-45 days of cold storage. The difference in score of the two lots after storage was not pronounced, but the Avenized wrapper was slightly more effective than the plain wrapper in retarding deterioration of the flavor of the surface of such butter. Retardation of loss in score seemed more likely to result from the use of Avenized parchment on neutralized sour cream butter than on sweet cream butter.

Preparation of starter for cheese, cultured buttermilk, and butter, G. H. WILSTER and F. E. PRICE (*Oregon Sta. Bul.* 379 (1940), pp. 24, figs. 10).—The design of a combined pasteurizer, cooler, and incubator for both large and small batches of starter is described, and detailed instructions for the preparation of the mother starter and the large batch of starter are presented. Characteristics of the bacteria in starters are also indicated.

Rate of rennet coagulation and curd tension of milk, with special reference to problems in cheese manufacture, J. C. MABQUARDT and M. NEEDHAM (*New York State Sta. Tech. Bul.* 257 (1941), pp. 16, figs. 2).—The influence of

various substances on the rate of coagulation and firmness of curd in milk was studied. The addition of lactic acid cultures or the development of lactic acid in normal milk decreased the time of coagulation and increased the curd strength as measured by coagulation with pepsin alone. Low- and high-tension milks were influenced alike by the addition of culture or the development of acid. The use of calcium chloride and hydrochloric acid in tests of curd strength as provided for in the Hill (E. S. R., 51, p. 379) or Mendenhall (E. S. R., 73, p. 533) procedures renders them unsuitable for typing milk cheese purposes. The addition of calcium chloride decreased coagulation time and increased the curd tension, while calcium oxide additions markedly increased the time for coagulation. Setting rates and curd strengths improved by excessive heat treatment were returned to their normal range by the addition of calcium chloride. Pectin and sugar exerted no significant influence on the setting rate or curd tension of normal milk.

Relationship of curing temperatures to quality of American Cheddar cheese, H. L. WILSON, S. A. HALL, and W. T. JOHNSON, JR. (U. S. D. A.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 169-177, figs. 2).—From 116 lots of cheese manufactured from good-quality milk, 4 duplicate cheeses (daisies) from each lot were stored for (1) 6 mo. at 34° F., (2) 3 mo. at 50° plus 3 mo. at 34°, (3) 6 mo. at 50°, and (4) 3 mo. at 60° plus 3 mo. at 34°. The majority of cheeses in groups 2 and 3 were better in quality than the duplicates in group 1, but the majority of those in group 4 were poorer in quality than those in group 1. In group 1, 68 percent of the cheeses scored 92 or above. Among the high-scoring ones 87 percent were as good as or better than the duplicates in group 1, while of the low-scoring ones only 32 percent were as good as the corresponding cheeses in group 1. Moisture content exerted a more pronounced effect on the quality of the cheese cured at the higher temperatures, less than 38 percent moisture being most desirable in such cases. It is concluded that cheese made from milk of good quality and by methods insuring cheese of good quality can be cured at temperatures as high as 50° with reasonable certainty of developing a clean and characteristic Cheddar flavor.

Pasteurized processed cheese, J. C. MARQUARDT (Farm Res. [New York State Sta.], 7 (1941), No. 2, pp. 12, 13, figs. 3).—The procedure for making pasteurized processed cheese is briefly described, followed by a general discussion of this phase of the dairy industry.

A device for measuring the body of cream cheese, Z. D. BOUNDY and J. PRICE. (Univ. Wis.). (*Jour. Dairy Sci.*, 24 (1941), No. 2, pp. 135-137, fig. 1). The apparatus described is a modification of that devised by Sommer and Matsen for measuring the curd strength in milk (E. S. R., 74, p. 839), a shaped plunger being substituted for the curd knife. The test proved simple, sensitive, and easily and quickly performed.

"Foreign" cheeses made in America, R. S. BREED (Farm Res. [New York State Sta.], 7 (1941), No. 2, p. 7, fig. 1).—A brief discussion of the stimulating effect on the production of various foreign cheeses in America as a result of drastic curdiment in importations from Europe (E. S. R., 82, p. 676).

Replacing cane sugar with variable increments of dextrose and cerelose in the ice cream mix, and its effect upon the physical and chemical properties of ice cream at different serving temperatures, W. H. E. COOLEY, and W. S. ARBUCKLE (Missouri Sta. Res. Bul. 323 (1940), pp. 29).—Three series of experimental ice creams were studied. Two contained 12 percent fat, 11 percent serum solids, and 10 percent sucrose, with 2, 4, and 8 percent of dextrose and cerelose in series 1 and 2, respectively. The third contained 10 percent fat, 13 percent serum solids, and 10 percent sucrose.

dextrose added as above. Ice creams containing dextrose or cerelese at maximum levels were readily frozen without difficulty in the continuous freezer. Ice creams containing 12 percent fat were preferred over those containing 10 percent fat. The former were preferred at a serving temperature of 10° F., the latter at 12°. The high-sugar ice creams were considered too sweet at the higher serving temperatures, but desirable at the lower ones. Ice creams containing 10 percent sucrose and from 2 to 6 percent of either dextrose or cerelese were preferred to ice cream containing 14 percent sucrose. Detailed information is presented on crystal structure and melting characteristics for the various ice creams. The ice crystals were larger and farther apart with added increments of dextrose or cerelese. The composition of the ice cream had a greater effect upon stability than the serving temperature. Those ice creams containing a combination of sugars were somewhat more stable than those containing only sucrose. Serving temperature was more important than the source or amount of sugars in determining the average weight of the number of dishes per gallon. Somewhat greater variation was found in the number of dishes per gallon in ice creams containing cerelese than in those containing dextrose.

Tests of enzyme converted corn sirup reveal desirable properties, P. H. CY and G. EDMAN. (Univ. Ill.). (*Food Indus.*, 12 (1940), No. 12, pp. 43-46, 5).—The enzyme-converted corn sirup used in these trials had a sweetening value of approximately two-thirds that of sucrose. It depressed the freezing point of water solutions somewhat more than sucrose but less than dextrose. Data are presented on the effect of substituting this corn sweetener for a part of the sucrose in ice cream mixes on the color, viscosity, acidity, curd texture, and freezing characteristics of the mix. When used to replace one-third of the sucrose in ice cream and one-half in sherbets and ices, it had no unfavorable effect upon color, viscosity, flavor, or melting properties of the frozen products. It retarded whipping slightly, but improved the body of both ice cream and sherbets or ices and aided in preventing surface crustation of the sherbets and ices.

VETERINARY MEDICINE

Work in animal pathology and parasitology by the Hawaii Station [*Hawaii Sta. Rpt. 1940, pp. 63-66, 82-83, figs. 2*].—The work of the year (E. S. R., 82, p. 517) reported upon includes treatment of fluky cattle with hexachlorocyclopentadiene and kamala extract, a method for estimation of fluke infection by egg counts, biological control of snail hosts, and poultry parasites, all by J. E. Henshaw; and fowl pox vaccination of day-old chicks, by L. E. Weaver.

Work in animal pathology by the Iowa Station [*Iowa Sta. Rpt. 1940, 1, pp. 122-123, 125-128, 190-194*].—The work of the year (E. S. R., 82, p. 818) reported upon relates to the etiology of range paralysis in poultry, by C. D. C. Murray, and H. L. Wilcke; utilization of radiant energy in the study of the etiological agent of fowl leucosis and treatment of the chick with radiant energy and its effect on the course of fowl leucosis, both by Lee, Wilcke, and W. Gowen; a study of the association of the so-called nonspecific enteritis of chickens with fowl leucosis and the production of antibodies against the agent of fowl leucosis, both by Lee and Wilcke; mode of inheritance of resistance to fowl leucosis and transmission of the iritis type of fowl leucosis by egg, sperm, and feculation, both by A. J. G. Maw, Wilcke, and Lee; breeding for resistance to fowl typhoid in poultry, by Gowen, E. W. Lindstrom, and Maw; and genetic investigation of resistance and susceptibility to typhoidlike diseases in laboratory animals, by Gowen and Lindstrom.

[Work in animal pathology by the Maryland Station] (*Maryland Sta. Rpt. 1940*, pp. 30-31, 35-37, 37-38, 43-44).—The work of the year (E. S. R., 82, p. 818) reported upon relates to control of Bang's disease in the station dairy herd; infectious enterohepatitis (blackhead) in turkeys; etiology of bovine mastitis and the value of autogenous bacterins in prevention and cure of the disease; so-called "running fits" in dogs; diagnosis, treatment, control, and eradication of bovine pyelonephritis and trichomoniasis; infectious equine encephalomyelitis; periodic or recurrent ophthalmia of horses and mules; calftubercle vaccination for Bang's disease; and plants poisonous to livestock.

Variation in dilution-counts of helminth eggs, B. G. PETERS and J. W. G. LEIPER (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 117-142, figs. 3).

The antigenic structure of organisms of the genus *Listerella*, J. S. PATERSON (*Jour. Pathol. and Bact.*, 51 (1940), No. 3, pp. 427-436).—Report is made of a study of the flagellar and somatic antigens of 54 strains of *Listeria* from a variety of animals and from man. Their antigenic structure permits of their division into four types. The two largest comprise 43 strains of animal and human origin. Ten strains isolated in Denmark from human infectious mononucleosis form a third type by themselves, while the strain Gibson is the only member of the fourth type. The bacteriological types do not bear any relation to the zoological species of the host or to the geographical distribution of the places of isolation. A list of 33 references is included.

The occurrence of zinc and other metals in the intestines of *Strongylus* spp., W. P. ROGERS (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 103-116).—Analyses were made of the intestines and their contents taken from several lots of *S. edentatus* and *S. vulgaris* and the amounts of certain metals and sulfur present estimated. "Zinc was found to be the most plentiful metal present, reaching a maximum of 0.58 mg. per worm. Copper, silver, and iron were the other metals recorded. The amounts of sulfur estimated indicate that the zinc was probably present as the sulfide. The possible situation of the zinc and sulfur-containing compound is discussed. Partial analysis of the mucosa of the horse taken from regions where the parasites were most frequently found revealed the presence of zinc and copper. The zinc reached a maximum concentration of 9.05 mg. per 100.2 gm. of mucosa. The probable sources of this zinc have been discussed. Calculation has shown that *S. edentatus* must ingest from 3.9 to 21.2 gm. of horse mucosa (or 53 to 282 times the average worm weight) to obtain the amounts of zinc found. In the case of *S. vulgaris*, 0.7 to 3.4 gm. of mucosa (or 62 to 284 times the average worm weight) are necessary. The fact that zinc appears to be accumulated in the parasites and is probably associated with sulfur has led to the suggestion that the zinc may be of some physiological importance, possibly acting as a sulfur acceptor in sulfur metabolism."

The chemistry and serology of the vibrios, R. W. LINTON. (Cornell Univ.). (*Bact. Rev.*, 4 (1940), No. 4, pp. 261-319).—This contribution is presented with a list of 160 references to the literature referred to.

How chemical and physical agents kill microorganisms, F. W. FABIAN. (Mich. State Col.). (*Canner*, 92 (1941), No. 14, pp. 11-12, 26, 28).

Bactericidal effect of an extract of a soil bacillus on Gram positive cocci, R. J. DUBOS (*Soc. Expt. Biol. and Med. Proc.*, 40 (1939), No. 2, pp. 311-312).—In this report the author records the isolation of an unidentified spore-bearing bacillus capable of causing the lysis of living Gram-positive cocci from a soil sample to which suspensions of these cocci had been added over a long period of time. Autolysates of cultures of the soil saprophyte have yielded a soluble factor which lyses living staphylococci, pneumococci (R and S forms, irrespec-

tive of type derivation), hemolytic, green, and indifferent streptococci (all types so far tested). The active principle is not volatile, does not dialyze through collodion membranes, and is heat-labile. It is very stable at alkaline reactions but is rapidly inactivated at reactions more acid than pH 5.5, even at room temperature. When maintained at 0° C. the active principle can be precipitated quantitatively at pH 4.2-4.4, and the precipitate, redissolved in a neutral medium, exhibits the lytic activity of the original solution. . . . The results of in vitro experiments seem to indicate that the protective action in vivo of the bacterial extract is due to a direct bactericidal effect on Gram-positive cocci. . . . The extract does not affect the viability or inhibit the growth of Gram-negative bacilli."

Studies on a bactericidal agent extracted from a soil bacillus, I-III (*Jour. Eept. Med.*, 70 (1939), Nos. 1, pp. 1-17; 3, pp. 249-256).—These further studies (see above) are reported in three parts.

I. *Preparation of the agent—its activity in vitro*, R. J. Dubos (pp. 1-10).—This contribution describes the isolation of the new soil bacillus and the preparation, properties, and activity of the soluble agent by means of which it attacks and lyses the living cells of the susceptible Gram-positive species. It includes a description of a cell-free extract obtained from autolysates of a particular strain of a soil bacillus which selectively inhibits the growth of all the Gram-positive micro-organisms so far tested and exerts on them a bactericidal effect in vitro.

II. *Protective effect of the bactericidal agent against experimental pneumococcus infections in mice*, R. J. Dubos (pp. 11-17).—In continuation of the above, it is now shown that the agent referred to protects white mice against infection with large numbers of virulent pneumococci. It also exerts a curative effect when administered to mice several hours after injection of the infecting organisms.

III. *Preparation and activity of a protein-free fraction*, R. J. Dubos and C. Cattaneo (pp. 249-256).—In the further study of the bactericidal agent, found to contain a protein precipitable at pH 4.5, the authors show that it can be obtained in an active form free of protein. The new purified preparations retain all the activity of the original material both in vitro and in vivo.

Fractionation of the bactericidal agent from cultures of a soil bacillus, R. D. HOTCHKISS and R. J. DUBOS (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 791-792).—The protein-free bactericidal material isolated from a spore-bearing soil bacillus, as noted above, has been further purified and three crystalline preparations highly bactericidal for Gram-positive micro-organisms have been obtained. "Two acid substances are isolated by solution of the crude material in alcohol, precipitation with 15 volumes of ether, and fractional crystallization of the dried precipitate from hot absolute alcohol. The third substance, which we have named gramicidin, is concentrated by repeatedly recovering the fraction which remains soluble in alcohol on the addition of 15 volumes of ether but is insoluble in absolute ether. Crystallization is effected by extraction with a mixture of equal volumes of acetone and ether, evaporating the extracts, and cooling a solution of the residue in boiling acetone."

Chemical properties of bactericidal substances isolated from cultures of a soil bacillus, R. D. HOTCHKISS and R. J. DUBOS (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 793-794).—This is an account of the preliminary chemical investigation of the three crystalline bactericidal substances described in the account noted above. Gramicidin has been most investigated, and contains 62.7 percent C, 7.5 percent H, and 13.9 percent N. The molecular weight as determined in camphor is about 1,400. Since with substances of this complexity the accuracy

of the determinations is limited, the empirical formula is presented, with reservations, as $C_{71}H_{120}N_{11}O_{14}$ or formulas differing from it by 1 or 2 atoms of carbon or hydrogen or by the difference C_6H_7NO .

The results of the study suggest that gramicidin is essentially a polypeptide containing 10 molecules of α -amino acids of which 2 or 3 are tryptophane residues. These and the aliphatic acid account for about 85 to 90 percent of the weight of the substance. The nature of the particular amino acids and the remaining constituents of the molecule is being investigated.

Graminic acid and gramidinic acid are similarly built up from amino acids and contain one free carboxyl group per molecule. They appear to contain one tryptophane group per molecule and furthermore each of them contains the amino acid tyrosine. Graminic acid (C 58.9, H 7.0, N 14.0) with a molecular weight of about 900 can be represented by the formula $C_{44}H_{62}N_{10}O_{11}$ (with the same alternatives as for the formula given before). Gramidinic acid appears to have a molecular weight of approximately 1,000.

The effect of specific agents extracted from soil microorganisms on experimental bacterial infections, R. J. DUBOS (*Ann. Int. Med.*, 13 (1940) 11, pp. 2025-2037, figs. 6).—A further report of the work noted above, from the author concludes that gramicidin does not belong to the class of enzymes and appears to be a true antiseptic. It is likely, therefore, that the proteolytic action induced in vivo by this new agent can be explained, in part at least, in terms of its bacteriostatic and bactericidal effect upon the susceptible bacteria. A list of 30 references to the literature is included.

Action of gramicidin on streptococci of bovine mastitis, R. J. DUBOS, and R. D. HOTCHKISS (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940) No. 2, pp. 444-445).—The finding by Dubos and his associates that gramicidin exerts a marked bactericidal effect against Gram-positive micro-organisms, both in vitro and in vivo, led the authors to study its effect upon *Streptococcus agalactiae*. Preliminary tests led to adoption of the following technique: Gramicidin in amounts of from 60 to 240 mg., diluted in 1,000 cc. of double-distilled sterile water at 40° C., was injected into infected quarters of the bovine udder in two cases of chronic mastitis. "Following the morning milking, the remaining milk in the cistern and in the teat was flushed out with 100 to 200 cc. of a dilute solution of gramicidin; 800 to 900 cc. of the preparation were then injected under pressure into the quarter and allowed to remain until the next milking. Within 1 hr. after the injection the treated quarter became distended and the rectal temperature began to increase, reaching 41° at the fifth or sixth hour. The temperature returned to nearly normal in about 3 hr. thereafter, and the acute swelling had about subsided at the next milking. Repeated treatments of the two animals mentioned above failed to eliminate permanently the streptococci from the infected quarters. This may be explained in part by the inadequacy of the method of administration of the bactericidal substance and also by the fact that these two animals were well advanced in lactation periods and that the infected quarters were severely indurated."

Of nine infected quarters in three cows that were less advanced in lactation period, repeated treatments failed to eliminate the streptococci from two quarters. "Five treatments were required to sterilize one of the quarters which was moderately indurated. These repeated treatments stimulated production of fibrosis and resulted in a decrease in milk secretion. The streptococci disappeared from the other six quarters (in five cases after a single treatment) without an appreciable decrease in milk production. The fact that streptococci had been eliminated was established by daily bacteriological examination of the milk over periods ranging from 15 to 81 days. . . . While

strep. cocci were not eliminated from all of the treated quarters, they were only slightly decreased after each treatment, and the findings thus confirm the results obtained in mice, namely, that gramicidin, when injected directly into infected focus, exhibits a definite bactericidal effect against streptococci."

Effect of gramicidin suspended in mineral oil on streptococci of bovine mastitis. R. B. LITTLE, R. J. DUBOS, and R. D. HOTCHKISS (*Soc. Expt. Biol. and Proc.*, 45 (1940), No. 1, pp. 462-463).—In further work (see above) the authors have found that sterile mineral oil is a suitable nonirritating vehicle for the administration of gramicidin. Of 42 quarters treated with gramicidin mixtures, only 4, which had received from 120 to 160 mg. of bactericidal substance, exhibited a severe reaction. On the second and third day following treatment the foremilk in 3 of these quarters was tinged with blood, whereas secretion of milk was suppressed for 4 days in a fourth quarter. The reaction in the remaining 38 quarters was milder than in those injected with gramicidin in water. On the basis of present experience, the following technique of treatment appears the most satisfactory: From 2 to 3 cc. of an alcoholic solution of gramicidin containing 40 mg. per cubic centimeter are emulsified in 5 cc. of sterile double distilled water and the emulsion mixed thoroughly with 5 cc. of heavy mineral oil. The gramicidin-oil mixture is injected into the cistern shortly after the morning milking and allowed to remain until evening milking. In usual cases the mildness of the reaction makes it advisable, if necessary, to repeat the treatment for several days in succession or to treat more than 1 quarter at the same time.

Of 31 quarters naturally infected with *Streptococcus agalactiae* and treated with the gramicidin-oil mixture, 26 appear to have responded by a complete disappearance of the streptococci. The infection in some of the cured cases was of a severe chronic nature. In 20 of the quarters, a single treatment sufficed, while 6 required additional treatments. The infection was not eliminated in

Surprisingly enough, less satisfactory results have been obtained in the treatment of bovine mastitis caused by *S. uberis*; of four cases of this type, 3 were treated with gramicidin-oil mixtures, only one responded completely. The cause of this discrepancy is under investigation."

In the case of 8 infected quarters treated with mineral oil alone, there was no reduction or even disappearance of the streptococci; the infection was overestimated.

When giving and acriflavine for the treatment of the chronic mastitis, R. B. LITTLE, R. J. DUBOS, and R. D. HOTCHKISS by type B No. 98 (1941), No. 768, pp. 189-199).—The results of treatment have been produced by coccic mastitis in 21 cows through injection into the cistern (see above), (2) acriflavine, and (3) novoxil. The use of novoxil, not unusual for a pure oxide of silver in mineral oil, are the animals with these results the authors have been led to suggest that the larger cocci are not eliminated by two treatments or by repeated injections of the gramicidin-oil mixture, it may be of use in the treatment of are invariably cases of dilute aqueous solution of gramicidin. In lots of 21 cows with these three different types of mastitis, then fall into 3 groups: 1) apparently were destroyed in 34 quarters, either standing with or without treatment, the streptococci were pushing against the wall of the cistern on a single treatment, while 10 required their legs back and feet ineffective in 11 quarters. Of the 17 quarters may not be observed in which streptococci were eliminated from 10, and dying on full feed is incidentally treated with some other agent such as pneumonia and bacterioloc novoxil. Of 7 quarters treated with novoxil alone, 6 were eliminated from 3.

A note on the interrelationship of deficiency diseases and resistance to infection, J. W. RIDDLE, T. D. SPIES, and N. P. HUDSON. (Ohio State Univ. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 361-364).

Comparative activities of certain antihemorrhagic compounds, H. J. ALMQUIST and A. A. KLOSE. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 55-59).

Antihemorrhagic compounds as growth factors for the Johne's bacillus, D. W. WOOLLEY and J. R. MCCARTER. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 357-360, fig. 1).—A description is given of the concentration of the active growth factor for Johne's bacillus from *Mycobacterium phlei*. It was found that while the antihemorrhagic vitamins were growth factors for the Johne's bacillus, something additional was supplied by the dried cells or metabolites of *M. phlei*, the growth being more rapid. "One percent of this material when added to the synthetic basal medium gave excellent growth. It was found that the active substance could be extracted from the cells by boiling water or by boiling acetone. The best concentrate obtained in this work was prepared as follows: *M. phlei* cells were extracted three times with boiling acetone. The extracts were concentrated under reduced pressure to an oil which was dissolved in ether. The ether solution was extracted four times with water. While the ether phase still contained some activity, the aqueous extracts showed maximum effect when added at a level equivalent to 1 percent of *M. phlei*, and this amount of material supplied only 10% of solids per cubic centimeter of medium. . . . Almost without exception bacterial growth factors have been found to be water-soluble compounds. Results of the present work show that the fat-soluble vitamins also play a role in the metabolism of certain bacteria. The effectiveness of antihemorrhagic compounds in promoting the growth of the Johne's bacillus demonstrates for the first time the part played by such compounds in bacterial nutrition. It is of interest to consider whether the utilization of a fat-soluble growth factor is in any way concerned with the very slow growth rate or with the high fat content of these organisms."

Variation of the prussic acid (HCN) content of Sorghum verticilliflorum at different stages of growth, W. R. WINKS (*Queensland Agr. Jour.*, 54 (No. 5, pp. 364-366).—Periodic determinations of the prussic acid content of wild sorghum indicated that it is dangerous to livestock throughout its life period. The secondary growth is particularly high in this principle.

The occurrence of selenium in Utah forage plants, W. L. HORTON (Utah Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 4, pp. 299-300) undertaken to determine the occurrence and amount of selenium in forage plants collected from various parts of Utah is reported. In the different areas were tested for their selenium content by the method using codeine, and those plants which contained more than 0.1 p. p. m. were further tested by the volumetric modified method of et al. (E. S. R., 74, p. 200). "Eighty-two percent of the forage plants from the Trout Creek area and 71 percent of the plants from the Antelope Valley area were found to contain small amounts of selenium. Twenty percent of the plants from the Trout Creek area contained 0.1 p. p. m. as compared to 8 percent of the plants from the Antelope Valley area. The majority of plants from the Trout Creek Reserve did not contain selenium, and the vetches, which are usually seleniumiferous, contained only a trace. All of the plants found capable of absorbing selenium and were found

absorbed. The most selenium found in any plant was 5.4 p. p. m. There was no apparent relationship between the amount of selenium and the percent of sulfur in the plants. It is concluded that small amounts of selenium occur in forage plants in some areas of the State of Utah, but none of the plants studied contained sufficient selenium to be considered toxic." A list of 20 references to the literature is included.

Progress made in the study of brucellosis during the past 25 years, I. F. HUDDLESON. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 768, pp. 181-188).—A review of the advance in knowledge of brucellosis, presented with references to the literature.

Brucellosis of cattle (Bang's disease, infectious abortion), A. EICHHOEN and A. B. CRAWFORD (*U. S. Dept. Agr., Farmers' Bul.* 1871 (1941), pp. [2]+22, figs. 5).—This is a revision of and supersedes Farmers' Bul. 1704 (*E. S. R.*, 70, p. 527).

A suggested program for the control of bovine mastitis in Michigan, C. S. BRYAN (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 152-155).—Directions are given for the proper collection and handling of milk samples to be tested, and recommendations are made for the prevention and control of mastitis. The tests should be applied at monthly intervals for 3 mo., then every other month for about 8 mo., and at 90-day intervals thereafter.

Observation on a case of listerellosis in sheep, H. A. HOFFMAN (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 768, pp. 234-235).—The identification of an infection of *Listeria monocytogenes*, here reported from California, is considered of importance particularly because of the fact that it has not been reported previously in the western United States.

Overeating (enterotoxemia) in feedlot lambs, F. THORP, JR. (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 186-187).—In investigational work by the author while at the Colorado Experiment Station, overeating was found to be the cause of the most serious disease of lambs on feed. It was encountered in about half of these submitted for autopsy. The consumption of too much concentrated feed, such as corn, cane, barley, and peas, seems to be the primary cause. Overeating results in an enterotoxemia, a thermolabile toxin having been found in the small intestines of a large percentage of the lambs dying of this condition. The contents of the small intestines from lambs dead of overeating are usually toxic for rabbits, guinea pigs, mice, rats, and lambs when given subcutaneously or intravenously. "The toxic intestinal contents are always neutralized by *Clostridium perfringens* antitoxin type D and usually by type B but never by types A and C. Experimentally the disease has not been produced by the oral feeding of the toxic material. However, the disease is probably due to the absorption of the toxin from the small intestines. It is not unusual for lambs to be found dead in the morning despite the fact that the animals were apparently healthy the night before. Scouring among some of the larger lambs manifested by the matting of wool with fecal material around and below the anus should be a warning sign. The affected animals are invariably the largest, fattest, most vigorous, and greediest lambs in the lots. A few of the animals may throw back their heads, stagger for a little while, then fall and die in convulsions. Others often live for a few hours, either standing with heads drawn back or heads lowered, moving in a circle, pushing against the fence, or falling to the ground and lying there swinging their legs back and forth. Recovery is rare in this disease. Gross lesions may not be observed in some of the acute cases. . . . A history of fat lambs dying on full feed is indicative of overeating provided autopsy fails to reveal pneumonia and bacteriological findings are negative. The finding of sugar

in the urine of acute cases is regarded as diagnostic. . . . If sudden death occur when lambs are on full feed or if some go off feed this should indicate a reduction in the amount of grain feed. Death losses can be stopped overn by withholding grain. The most satisfactory method of control is to decrease the grain to a point where no further trouble occurs and then increase gradually."

Diseases of the pig and its husbandry, D. J. ANTHONY (*Baltimore: Williams & Wilkins Co.*, 1940, pp. XI+272, figs. 48).—The subject is dealt with in 11 chapters.

A new *Salmonella* type isolated from apparently normal hogs, P. R. WARDS, D. W. BRUNER, and H. L. RUBIN. (*Ky. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 395-397).—A hitherto unrecognized *Salmonella* type isolated frequently from the mesenteric lymph glands of apparently normal hogs slaughtered at an abattoir in Kentucky is described as *S. lewington*. The organism is represented by the antigenic formula III X XXVI:Z₂₀:1,5...

Cystitis in a stallion due to an amorphous calculus with involvement of the genital tract, A. G. KARLSON, W. L. BOYD, and D. B. PALMER. (*Minn. F. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 768, pp. 232-233).

Infectious equine encephalomyelitis: A review of recent literature [in title], A. BRION (*Rec. Méd. Vét.*, 116 (1940), No. 3, pp. 97-122, figs. 5).—This review is presented with a list of 90 references to the literature.

Hereditary transmission of the western type of equine encephalomyelitis virus in the wood tick *Dermacentor andersoni* Stiles, J. T. SYVERTON, and P. BERRY (*Jour. Expt. Med.*, 73 (1941), No. 4, pp. 507-530, pls. 2, figs. 3).—A detailed description is given of experiments that have demonstrated the hereditary transmission of the western type of equine encephalomyelitis virus by the Rocky Mountain spotted fever tick. Under experimental conditions the virus was carried in this tick for two successive generations, possibly for the third, passing certainly once, and possibly twice, from the female through eggs to the larvae. The virus-carrying larval, nymphal, and adult stages of this tick, furthermore, are capable of infecting susceptible hosts when they are permitted to feed on them.

Influence of age on rate of immune response of mice to formalized equine encephalomyelitis virus, I. M. MORGAN (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 473-475, fig. 1).—In a study of mice of three age groups the rate of development of neutralizing antibodies in serum immunized with formalin-inactivated virus of eastern equine encephalomyelitis was shown to increase progressively with age. The antibodies in serum of mice immunized at a young age did not reach the maximum titer found in mice immunized when older. The low degree of active immunity to intracerebral injection of active virus induced in mice 14 days old at the beginning of immunization did not increase from 2 to 4 weeks after immunization. During that interval mice immunized at 3 mo. of age maintained a high degree of active immunity.

Relationship of Moscow 2 virus of equine encephalomyelitis to rabies, B. HOWITT. (*Univ. Calif.*). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 69-73).—Studies of the virus designated as Moscow 2, which was placed in the group of neurotropic agents causing encephalomyelitis in horses by Vlesky and coworkers, are reported upon. This work has led to its being classified with the rabies strains rather than with the American viruses causing equine encephalomyelitis, as formerly suggested.

Internal parasites of birds, I, II, F. R. BEAUDETTE (*New Jersey Stas. Hb. to Poultrymen*, 27 (1940), Nos. 5, pp. 4; 6, pp. 4).—A brief general account of the endoparasites of birds which includes their prevention and drug treatment.

The nutritional deficiency diseases of chickens, I. C. NORRIS. (Cornell U.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 768, pp. 200-205, figs. 5).—**Influence of bile acids, vitamin K, and cincophen on erosions of the chick gizzard lining, H. J. ALMQUIST and E. MECCHI.** (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 168-172).—In this further report S. R., 81, p. 409) the curative and preventive effect of bile acids, particularly cholic acid, in experimental deficiency lesions or erosions of the chick gizzard lining is dealt with. The results reported have confirmed the earlier findings. Cholic and dehydrocholic acid consistently show strong preventive action against gizzard erosions at 0.5 percent of the diet. Dehydrocholic acid, the only bile acid apparently nontoxic to be administered by injection, is not preventive when so administered. Deoxycholic acid is undoubtedly the least effective of these bile acids. Although the evidence has indicated that gizzard erosions are independent of vitamin K deficiency, a relation has been suggested. It was observed that progressively massive doses of the highly potent antihemorrhagic compound 2-methyl-1,4-naphthoquinone tended to reduce the discoloration due to decomposed blood and the erosions, but not the actual erosions. The more potent, water-soluble ethyl-1,4-naphthohydroquinone diphosphoric acid ester and the synthetic vitamin K₁ 2-methyl-3-phytyl-1,4-naphthoquinone were fed in large doses but had no effect in reducing gizzard erosion. In the presence of a suboptimal amount of vitamin K₁ (½ mg. per kilogram of diet) cholic acid was able to maintain the erosion score at a low value. Preliminary tests with cincophen showed that the addition of 0.5 percent to the basal deficiency diet caused a slight increase in severity of the lesions. Cholic and dehydrocholic acids were found to exert a protective effect even in the presence of cincophen. Chicks reared on a practical ration which ordinarily permitted no erosions were found to develop erosions closely resembling the deficiency type, even to the usual discoloration, when fed cincophen. At least 1 percent in the diet was required to cause severe erosions. 0.05 percent of cincophen was decidedly inhibitory to growth and caused heavy mortality.

Lethal dermatitis in chickens produced by external application of fat, BEN-DOR. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 495-497).

Prevention of nutritional myopathy of ducklings by α-tocopherol, A. M. SPENGLER. (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 457-459).—It was found that the nutritional myopathy of ducklings which develops on vitamin E-deficient diet is completely prevented through the experimental period by the administration of 4 mg. of synthetic α-tocopherol. A dosage of 1 mg. daily does not afford protection.

Mapharsen as a treatment for enterohepatitis of turkeys, F. M. BOLIN and H. VARDIMAN. (N. Dak. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 768, pp. 229-231, figs. 3).—In the treatment of turkeys suffering from enterohepatitis with the organic arsenic compound mapharsen, six out of eight clinical cases recovered. Attempts to diagnose blackhead by the Rose Bengal agglutination test failed. Birds affected with blackhead were unable to eliminate the dye and succumbed as a result. A description is given of the surgical technique by which accurate diagnosis can be made for experimental purposes.

Treatment of cecal and liver trichomoniasis in turkeys by fever therapy, W. OLSEN and E. A. ALLEN. (U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 875-876).—Experimental work on the use of fever therapy for the cure of cecal and liver trichomoniasis in turkeys, under way since 1937, is briefly reported upon. The protozoan parasite *Trichomonas gallinarum*, which invades the tissues of the lower digestive tract of birds and in chronic infection produces lesions in the ceca and liver, is responsible for this wide-

spread disease of domestic fowls. The lesions closely resemble, and undoubtedly have been often confused with, those produced by *Histomonas meleagridis* in the disease commonly known as blackhead. Young birds usually die from 4 to 8 days after exhibiting the first symptoms of the disease, although in mature birds the period between the first symptoms and death may be much longer.

"Birds undergoing treatment were placed in a thermostatically controlled cabinet for periods ranging from 1 to 2 hr. The internal body temperature of the bird was raised from 2° to 6° above the normal of 103.5° F. by maintaining an air temperature within the cabinet of approximately 104° and a relative humidity of 60 to 70 percent. The duration of treatment depended upon the physical condition of each bird and its ability to withstand the increased temperature. Usually three treatments at intervals of every other day were sufficient to check the disease, although as many as six treatments were necessary in a few more advanced cases. After treatment the birds were placed in wire-bottomed cages at room temperature. Heat treatment was administered to 19 turkeys in which trichomoniasis was diagnosed by external symptoms and microscopic examination and to 5 turkeys in which liver and cecal lesions were directly observed. Twenty of these 24 treated birds recovered, while 4 failed to respond to treatment. Those birds which recovered usually showed signs of improvement after the second or third treatment, began to eat voluntarily, gained in weight, and behaved like normal, active birds. Four adult turkeys were killed at different stages of recovery following treatment, and post-mortem examination disclosed that many of the liver lesions had almost disappeared and all others were in process of healing. Cultures made from the necrotic areas of these livers were completely negative for trichomonads. Of the 4 birds which failed to respond to the treatment, 2 died during or shortly after being given the first treatment. Nine turkeys with trichomoniasis were kept in cages similar to, and fed rations identical with, those of the treated birds. Seven of these died as a result of the disease, and trichomonads were cultured from their livers and ceca, while the remaining 2 birds recovered. These results indicate that turkeys having trichomoniasis of the lower digestive tract can be effectively treated with fever therapy."

Ulcerative enteritis in quail, A. J. DURANT and E. R. DOLL (*Missouri Sta. Res. Bul. 325 (1941), pp. 27, figs. 7*).—A contagious disease of wild fowl, including the common bobwhite, California quail, mountain quail, sharp-tailed grouse, Gambel's quail, European partridge, chukar partridge, and the wild turkey, and of the domestic fowl, under study at the station is reported upon. Epizootics have been observed by the authors in which flocks of quail of from 50 to 60 birds in batteries have all died within 15 to 18 days following the first loss from the disease. Flocks of young birds, 10 days to 2 weeks of age, numbering from 40 to 60 have been observed in which all birds succumbed in a week to 10 days after the onset of the epizootic.

The investigation was directed toward isolation of the etiological agent. Exhaustive use of Berkefeld and Seitz filtrates prepared from ulcers has shown the causative agent is not a filter-passing virus. The supernatant fluid or residue from the filtration has in all cases proven infective for quail. No protozoan organism has been associated with the etiology of ulcerative enteritis in quail. Findings in the intestinal contents and smears from ulcers have been negative. A large number of histologic sections have not shown protozoan organisms. However, limited observations on this disease in chukar partridges indicated that coccidia may act as a predisposing agent. Although no organism was isolated which would produce the disease, the etiological factor is thought to be of bacterial nature. This view is supported by the infectivity of residues from filtration and the ease with which the infectious material can

be maintained outside the host. In the form of macerated lesions the etiological agent has remained viable 168 days in the refrigerator at 4° C., 47 days in moist soil, and 47 days in dried intestinal contents. The infectious agent is also destroyed by heating at 60° for 10 min. The contagious nature of the disease and the failure to incriminate a filtrable virus or protozoan organism also indicate an etiological factor of bacterial nature.

Quail have been found to offer very little resistance to this disease. Approximately 250 birds were observed during this investigation, and no bird which showed symptoms following exposure or inoculation per oris with known infectious material has recovered. From more than 100 birds which were given infectious suspensions only 4 failed to show symptoms of the disease. Two of these birds were subjected to repeated inoculations without producing symptoms, but small amounts of serum from 2 of these resistant birds failed to protect healthy birds against the disease. Chukar partridges have been markedly resistant to ulcerative enteritis, but cases have been observed in conjunction with coccidiosis. Domestic chicks and poults have been found refractory to this disease.

AGRICULTURAL ENGINEERING

Research and investigational activities in agricultural engineering, C. E. Serrz (*Va. Engin. Expt. Sta. Bul.*, 34 (1940), No. 3, pp. 58, pl. 1, figs. 20).—This bulletin reports upon soil and water conservation, rural electrification, household equipment, farm power and machinery, and farm-building investigations.

[**Agricultural engineering investigations by the Arizona Station**] (*Arizona Sta. Bul.* 171 (1941), pp. 180–183, figs. 4).—This bulletin reports leveling of land from an average gradient of 2 in. per 100 ft. to a dead level, with a resultant improvement of penetration by irrigation water such that the crop increases of one or at most two seasons have paid the cost of the leveling; experiments with the traveling hay baler which has brought about a general use of the machine throughout the State; and establishment of the border disk as an implement valuable for the rapid raising of high water-controlling borders and for elimination of weeds by occasional use after bordering.

[**Agricultural engineering investigations by the Iowa Station**]. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt.* 1940, pts. 1, pp. 55–64, 147–149, figs. 2; 2, pp. 18–19, 20–23).—These have included in part 1 an analysis of farm-building losses due to wind and fire, atmospheric exposure tests of wire and fencing, utilization of plywood, steel, and lumber in farm-building construction, and farm-fence construction, all by H. Giese; the agricultural engineering service, directed by J. B. Davidson; work on farm-building insulation, by H. J. Barre; a study of the efficiency and economy of pneumatic tires for transport wheels on agricultural equipment, by E. G. McKibben; and hill-culture studies with trees, shrubs, and ground-cover plants for conservation and erosion control, by J. M. Aikman.

Part 2 notes trials of the efficiency of corn pickers, by C. K. Shedd, Davidson, and E. V. Collins; seedbed preparation for corn, and corn-production methods and equipment, both by Davidson, Collins, and Shedd; and methods, equipment, and buildings for storage and curing of corn, by Barre, Davidson, J. L. Robinson, and G. Semenik.

[**Agricultural engineering investigations by the Maryland Station**] (*Maryland Sta. Rpt.* 1940, pp. 18–20, figs. 2).—Work is reported on an electric pasteurizer of 40 gal. daily capacity and accurate to 0.5° in temperature control and on a large portable grain dryer.

Cultural engineering investigations by the New Mexico Station [*Mexico Sta. Rpt. 1940, pp. 72-74*].—These included duty-of-water investigation and work on rate and cause of rise of ground water in the Mesilla

Water facilities area planning handbook (*U. S. Dept. Agr., 1941, pp. [3]+59*).—This handbook is intended as a guide to the area-planning phase of the water facilities program of the Department of Agriculture. Its purposes are (1) to orient the function of water-facilities area planning in the broad field of water planning, and (2) to provide a handbook which will facilitate water-facilities area planning.

Water facilities procedure manual (*U. S. Dept. Agr., 1940, pp. [69]*).—This manual analyzes the Water Facilities and Emergency Relief acts under which work concerned is to be carried out and details procedure to be followed in administration and area planning, the operations policies, docketing, etc.

Irrigation water pumping costs in Beryl area investigated, G. D. CLYDE and Home Sci. [*Utah Sta.*], 2 (1941), No. 1, pp. 7-8, figs. 2).—The author investigated the present and potentially practicable acreage under irrigation in the Beryl area of Iron County, Utah, very largely deserted by 1938.

It was found that very inefficient pumping equipment was found in the parts still farmed. The conclusion reached was that if the quantity of water applied can be held down to 2 to 3 acre-ft. per acre the water cost is within economically reasonable limits for general farm crops where the total lift is not over 30 ft. The water supply is limited to the average annual recharge, however, and is estimated at not more than from 10,000 to 12,000 acre-ft. annually. Irrigated acreage should not exceed about 5,000 on the basis of available water and cost of water only. It is pointed out that soil fertility will also

be taken into consideration before definite recommendations concerning the future of the area can be made.

Terrace construction with small equipment in the South, W. A. WELD and PRICE (*U. S. Dept. Agr., Soil Conserv. Serv., 1940, pp. 11, figs. 6*).—It is pointed out that the drainage or channel-type terrace is the most satisfactory on-off control. The construction of such terraces by means of the plow, harrow, roller, plow and V-drag, one-way disk tiller, and the small-blade terracer is briefly discussed and illustrated.

Planning for terrace maintenance in the South, J. M. DOWNING and P. M. PRICE (*U. S. Dept. Agr., Soil Conserv. Serv., 1940, pp. [11], figs. 8*).—It is recommended that terrace maintenance be made a part of the regular tillage operation rather than a separate job. When land is prepared by flat breaking or strip plowing, terrace maintenance becomes a part of land preparation at no extra cost. Farming practices on terraced fields should also be adjusted so that not only the terraces but also the intervals between terraces are properly maintained. One-land and two-land plowing and the use of the one-way disk tiller are among the methods discussed.

Best action in highway bases and subgrades, H. F. WINN and P. C. RUTLEDGE (*Purdue Engin. Expt. Sta. Res. Ser., 73 (1940), pp. 104, figs. 41*).—The soils investigated include a natural sandy clay susceptible to severe frost action and mixtures of this clay with concrete sand and with pit-run gravel, and admixtures of lime chloride, calcium chloride, calcium oxide, portland cement, tar, emulsion asphalt, cut-back asphalt, road oil, and a resinous byproduct of turpentine distillation.

The addition of small percentages of bituminous admixtures to a sandy soil greatly increased its permeability. Larger percentages of admixture (10 to 12 percent by weight) reduced the permeability approximately

to that of untreated soil. To a lesser degree portland cement admixtures gave the same results.

Field observations of soil temperatures and of moisture-content variations in treated and stabilized soils and soil mixtures under actual climatic conditions occurring in central Indiana, automatically recorded during the period from January 6 to April 1, 1939, indicated that fluctuations in air temperature over a period of a few days did not cause corresponding fluctuations in the temperature of subgrade soil, but that subgrade temperatures are a function of cumulative temperatures rather than periodic air-temperature fluctuations.

The percentage of heave indicates the general extent to which frost action may be expected to occur in various mixtures but cannot be taken as a basis for rigid comparison of mixtures or admixtures, the exact extent of the heave being entirely dependent upon the conditions of initial moisture content, density, thickness of layer, and temperature. A variation in any one of these might result in a decided change in the relative amounts of damage. In general, the natural fine-grained sandy clay started to heave sooner, heaved at a greater rate, reached a greater total heave, reached capillary saturation more readily, and had less resistance to moisture-content fluctuation than did the treated and stabilized sandy clay exposed to the same conditions. The data indicate that the frost line penetrates a graded-soil mixture at a greater rate than it does a natural fine-grained sandy clay. Rapid freezing results in less ice segregation and less total heave for the same depth of frost penetration. Available data indicate that there is a critical density for sandy clay at which frost action occurs most readily when material is saturated. Below the critical density, frost action is directly proportional to density; above the critical density, frost action is inversely proportional to density. Increasing density above the critical density increases the period of inactivity before frost starts and decreases the rate of heaving and total heave in a manner similar to that of the addition of admixtures.

All the admixtures tested were much more effective in reducing frost action when used with well-graded soil mixtures than when used with natural sandy clay. Lime did not increase resistance to frost action enough to warrant use. Sodium and calcium chlorides reduced the frost damage primarily by lowering the freezing point. Of either chemical, 2 percent actually retained, and soil prevented freezing at from -10° to -15° F. Resistance to frost action in soil-cement mixtures and in bituminous mixtures was inversely proportional to the degree of water saturation at the beginning of freezing. Portland cement, tar, cut-back asphalt, road soil, emulsified asphalt, and "vinisol" (a by-product of turpentine distillation) added stability to a sandy clay by inhibiting lateral motion of the water to various degrees closely related to the percentage of admixture and moisture content of the mixture at the time it is exposed to the water.

Beech: Its production, properties, uses, seasoning, and treatment. HOYLE, H. L. HENDERSON, J. O. BLEW, and N. C. BROWN (*N. Y. State Col. For. Syracuse Univ., Bul., 13 (1940), No. 3, pp. 76, figs. 24*).—Part 1 deals, in accordance with the general characteristics of trees and logs, production, structural properties, characteristics, machining and behavior characteristics, early uses of beech, uses of beech in industry, and uses of beech in construction. Part 2 deals with air seasoning and kiln-drying of beech. With respect to air seasoning, it is concluded that beech sapwood will dry without surface checking and cracking at almost any season of the year and will dry much faster than heartwood in any season, reaching 20 percent moisture in about from 2 to 3 weeks in summer and from 8 to 10 weeks during the winter. Heartwood of beech surface

readily but if its rate of drying can be held down to 1 percent loss a day either by a humid atmosphere or by close, protected piling, no surface checking will result. Surfaces of boards exposed to direct sun will start surface checking in from 24 to 48 hr. When beech lumber reaches 15 percent moisture content any surface checking is largely invisible as the checks have closed by internal shrinkage. Warping and cupping are not pronounced in air-seasoned beech if care has been exercised in piling.

The kiln-drying experiments showed that 1-in. beech lumber can be kiln-dried without any appreciable amount of surface checking in from 14 to 16 days; the 2-in. beech lumber in from 36 to 38 days. In drying green beech the relative humidity must remain above 90 percent for about one-third of the drying period if surface checking is to be prevented. The optimum rate of drying of 1-in. lumber is 4.5 percent per day; of the 2-in. lumber, 1.6 percent per day. Intermitent steaming is beneficial in the prevention of severe case hardening strains and seems to prevent excessive warping. Most of the surface checking of air-seasoned beech will surface out during manufacture if the kiln-drying has not deepened the checks. Beech squares and other small dimension will dry under the same drying schedules as lumber but faster.

Part 3, on the preservative treatment of beech, brings together service records from various sources. From these, and other information presented, it is concluded that, for use as cross ties, this wood has demonstrated a superiority over other creosoted woods more frequently selected for this purpose. Because beech is readily available in New York State a potentially large market exists for the two products mentioned above, as it is estimated that over 800,000 cross ties and more than 10,000,000 fence posts are required in this State each year to replace those no longer fit for service. With preservative treatment beech should fill a large part of these requirements. Creosoted beech highway posts should give at least 30 years' service, and on this basis should result in lower annual costs than either steel or concrete.

Some facts concerning costs of operation of farm motor trucks, M. P. RASMUSSEN and P. S. WILLIAMSON (*New York Cornell Sta. Bul. 747 (1941), pp. 29, figs. 3*).—The data presented are based on 1,384 records of truck costs obtained from farmers by the survey method for the year ended June 30, 1934, and on cost-account records kept by 75 farmers for the 1938 crop year.

Trucks included in the survey were driven an average of 5,255 miles during the year, compared with 5,439 miles for trucks on cost-account farms. Costs averaged 7.5 ct. per truck-mile on farms included in the survey and 5.5 ct. on cost-account farms. The most important factor affecting the cost per mile was the mileage driven. One-half of the trucks were driven less than 4,000 miles and only 5 percent were driven more than 15,000 miles. Costs for less than 4,000 miles averaged about 12 ct. per mile as compared with about 5 ct. per mile for 15,000 miles or more. The 1.5-ton truck was used on one-half of the farms in the survey. Its costs per mile averaged 6.6 ct. on surveyed farms. Large trucks, mainly 1.5-ton, on cost-account farms cost 6.3 ct. per mile. Depreciation, insurance, license, and interest on the investment cost 12 ct. per mile on trucks driven less than 1,000 miles compared with about 4 ct. for trucks driven between 5,000 and 10,000 miles. Depreciation averaged \$116 per truck per year (2.2 ct. per mile) and exceeded the cost of gasoline on 1.5-ton trucks driven less than 10,000 miles per year. It appeared doubtful whether a farmer should use a truck valued at more than \$500 unless he uses it for more than 5,000 miles or unless he is willing to pay more than 10 ct. per mile.

The Nebraska tractor tests, 1920–1940 (*Nebraska Sta. Bul. 330 (1941), pp. 48 + [1], pls. 16*).—Tractor tests totaling 108 and carried out in a manner

similar to those previously reported upon (E. S. R., 83, p. 114) are here reported. The bulletin is accompanied by a supplement summarizing numerical results for tests from 1920 to 1941, except for models no longer on the market.

Experiments in the use of vapor-spray equipment, O. K. HEDDEN and R. M. MERRILL. (Coop. Ohio and Mich. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 598 (1940), pp. 20, figs. 7).—An oil-fired commercial vapor-cleaning unit was adapted for vapor spraying of insecticides and fungicides. Dimensions of parts for many of the necessary alterations are stated, and the changes and additions are described in detail.

In comparative tests of the effectiveness of the vapor-spraying apparatus and conventional hydraulic-spraying equipment, a few materials were more effective when applied in a vapor spray, but many were less effective. Sulfurs seem to be particularly adapted to application by the vapor sprayer. Within the scope of the experiments made, it is concluded that the use of vapor spray as an insecticide or fungicide carrier is apparently limited to special cases requiring the application of fixed nicotine or sulfurs. Sulfur sprays, especially, adhered better when thrown by the vapor sprayer. Free nicotine, phenothiazine, and bordeaux mixtures, on the other hand, suffered serious deterioration when projected by vapor spraying. The quantity of water required was reduced by from one-third to one-half as compared with that used in hydraulic spraying, but the added cost of the necessary oil heat practically offset this saving, leaving the cost of the two methods, with correct operation of the equipment, about the same.

A conveyor for handling potatoes: Time is saved—quality improved, E. J. WHEELER, F. LINENBAUGH, and C. H. JEFFERSON (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 164-168, figs. 2).—The authors describe an elevator consisting of a belt conveyor, a hopper, and a carriage which serves both to regulate the height of the belt and to make the unit portable. For a new belt a two-ply 16-in. canvas belt may be obtained at a cost of approximately 50 ct. a lineal foot. The authors used a part of a rubber belt salvaged from a large industrial

stable

per parts of the stored wheat mass although temperatures low enough to them are reached at other points in the same bin.

Electric fencing.—Progress report, J. E. NICHOLAS and F. I. BENTLEY (*Pennsylvania Sta., Jour. Ser. Paper 915 (1939), pp. 3, figs. 3*) —In the work thus far tested both battery-operated sets (6 to 15 v. input) and those using alternating current (110 to 120 v.) were tested, as were also wood and steel posts, wire and 2-strand fences, and other details of set-up. Wiring diagrams and some constructional detail of fences satisfactory for large and for small pens are given. It was found that all the older animals carefully avoided second contact with the fence. Heifers without previous training broke through once but were held satisfactorily after being returned to the same enclosure. Young pigs pushed under the low wire or between 2 strands but did not break the fence after one such experience. No accidents have occurred during the 3 yr. of work thus far completed, and various precautions are emphasized.

AGRICULTURAL ECONOMICS

Investigations in agricultural economics by the Iowa Station, 1940] *Iowa Sta. Rpt. 1940, pt. 1, pp. 239-231, 235-254, 263-265, 265-268, figs. 4*).—The results not previously noted are reported as follows: (1) Chart by V. Schultz and R. C. Bentley showing by years 1910-21, the returns from cattle, hogs, and butter and eggs per \$100 spent for feed; (2) brief statements by W. W. Wilcox showing (a) information as to number of farmers entering in the 1939 A. A. A. program and the effects of the program on yields of different crops and on the energy value of total feed production, how benefits were shared by landlords and tenants, and (c) chart showing the changes in Iowa corn acreages since 1900. (3) tables and charts by L. G. Allbaugh showing the changes in the number of farms and the number of acres for poultry, hogs, and cattle, and the average price received for these products.

and the percentages of value of such cuts in 1925 and 1940; (12) the of trade agreements on exports and domestic demand for agricultural modifies, as briefly discussed by Schultz; (13) for the project on statistical investigations of experiment station data, with G. W. Snedecor, G. M. W. G. Cochran, and C. Winsor as leaders, some brief statements as to exact methods, techniques, and formulas that have been developed; and a description and some findings for the investigations being made on project on development and testing of techniques suitable for a partial under the leadership of Snedecor and Schultz.

[Investigations in agricultural economics by the Iowa Corn Belt Institute, 1940] (*Iowa Sta. Rpt. 1940, pt. 2, pp. 67-72, fig. 1*).—Includes data by F. Robotka and L. C. Bentley as to the history and development of farmers' elevators; the business, membership, patrons, etc., of such elevators; the financial stability of such elevators and the factors affecting it, on an analysis of audited reports of 55 elevators for which such reports are available for a 10-yr. period; and the income from grain in cooperative elevators. The competition in corn and sorghum production in the Corn Belt of Kansas, Oklahoma, and Texas is discussed by T. W. Schultz, with a showing the corn acreage in Kansas, Oklahoma, and Texas during different periods 1919-23 to 1935-39.

[Investigations in agricultural economics and farm management by Maryland Station, 1939-40] (*Maryland Sta. Rpt. 1940, pp. 8-15*).—General findings of investigations not previously noted are included as follows: (1) Data on farm fire insurance costs in the State; (2) an economic analysis of the potato enterprise in Garrett County; (3) a report of the joint tax committee of the Maryland State Grange and the Maryland Farm Bureau on the production and marketing of Maryland sweetpotatoes.

[Investigations in agricultural economics by the New Mexico Station, 1940]. (Partly coop. U. S. D. A.). (*New Mexico Sta. Rpt. 1940, pp. 10-15*).—Results not previously noted are reported as follows: (1) A table which shows the estimated prices received by farmers for onions in selected States, average 1929-33 and 1934-38 and annually 1934-38; (2) a general statement as to opportunities for marketing New Mexico fruits and vegetables in Texas; (3) a table showing for slaughter cattle, stocker and feeder calves and lambs the average net returns per head, dollar of feed expense, and roughage fed as shown by approximately 30 feeding records for 1938-39 in the Pecos River Valley; (4) a table showing the average operating and administrative expenses by items per gin, running bale, and 100 seed cotton for 10 cooperative cotton gins in the State for the 1938-39 season; and (5) a statement as to the average yields per acre of grain sorghum in straight-rowed and contoured fields in Curry County in 1939 and the additional tractor time required on contoured fields.

Tax delinquency as related to local government organization and administration. M. H. TAYLOR. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 3, No. 4, pp. 27-30*).—From this discussion it is concluded that "there is a decreasing amount of rural land reverting to the counties of North Dakota through tax deed action. Consequently, there is considerable talk about taxes being too high. Taxes are high only in relation to the ability of individuals to pay taxes or in relation to the services rendered by local governmental agencies. If the rural people after weighing taxes against this criteria conclude that taxes are still too high, they should ascertain the possibilities for reduction of governmental functions. The reduction will probably have to be effected through curtailment of the services rendered, or by a reorganization of the

government to obtain increased efficiency, or by reducing the number of governing units. The nature of this reorganization or the services (roads, schools, townships, and so forth) which may be curtailed is a question for the people of the respective counties to decide."

A cost of production study of tomatoes in north Louisiana, 1939, T. M. MONTGOMERY, JR., and J. N. EPPERSON (*Louisiana Sta. Bul. 329 (1941), pp. 12*).—Detailed records of costs and returns from the tomato enterprise and general information regarding the farm business were obtained from 181 farmers with 201 acres of tomatoes and analyzed.

The average total costs of production and marketing were \$17.49 per thousand plants set and \$24.94 per ton of tomatoes produced. The average total returns were \$30.43 and \$43.37, respectively. Of the total cost, seedbed costs were 24 percent, growing costs (field) 57 percent, and harvesting and marketing costs 19 percent. Forty-eight percent of the total costs were labor charges. The average return to farmers was 25.4 ct. per hour spent on the tomato enterprise. Forty-four of the farmers experienced a net loss in tomato production, but only 6 had a minus return per hour of labor. Twenty-two farmers received over 50 ct. per hour spent on tomato production. In general, growers with less than 4,000 plants set per farm had a cost of \$21 per thousand plants set while those with 6,000 or more plants had a cost of only \$16 per thousand plants. Costs were as high where less than 1,000 lb. were produced per thousand plants as where 1,500 lb. or more were produced. Producers receiving less than 2 ct. per pound for tomatoes sold had a net return of about \$5 per thousand plants set as compared with \$17 for producers who received more than 2 ct. per pound.

Application of 180 lb. or more of commercial fertilizer per 1,000 plants increased yields and net returns. Use of manure decreased yields and net gains. Use of dusts and sprays increased yields and net returns. Early setting of plants in the field, fairly wide spacing of plants in the field, and use of home-grown plants gave higher yields and higher net returns.

Horse costs in Michigan 1937-39, F. M. ATCHLEY (*Michigan Sta. Quart. Bul., 23 (1941), No. 3, pp. 181-186, figs. 3*).—An analysis is made of horse cost records kept by 21 farmers in 1937, 15 in 1938, and 15 in 1939. Tables show the average costs by items, the net cost per horse hour, the net cost of horse work per farm, age distribution of horses, amount of feed fed, feed prices, relation of hours of horse work to horse costs and relation of labor, and power costs per farm and productive man-work unit on farms with and without tractors. Charts show the distribution by items of horse costs, the influence of hours of horse work on hourly costs of keeping horses, and the monthly distribution of horse work.

The average net cost per horse decreased from \$115 in 1937 to \$75 in 1939, averaging \$96 for the 3 yr. The cost per horse hour, respectively, for the 3 yr. were 14.8 ct., 10.9 ct., and 10.3 ct., average 12.5 ct. Of the costs, feed constituted 47 percent, man labor 21, depreciation 12, shelter 7, interest 6, bedding 4, and other costs 3 percent. The net cost per hour of horse work was 18.5 ct. where there were less than 600 hr. work per year, 14.5 ct. with 600 to 799 hr., and 8.3 ct. with 800 or more hours. The farms with tractors had 480 and the nontractor farms 357 productive man-work units per farm. The tractor farms had 256 and the nontractor farms 218 productive man-work units per man.

Weber Central Dairy Association has effectively marketed dairy products for its members, H. H. CUTLER and W. P. THOMAS (*Farm and Home Sci. [Utah Sta.], 2 (1941), No. 1, pp. 5, 8, fig. 1*).—This is a brief general article outlining the reasons for the success of this cooperative association, organized in

1924, which markets dairy products for producers in Weber, Morgan, Davis, and Box Elder Counties, Utah.

Home-grown farm produce used by the farm household, J. C. DOWETH (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 3, pp. 175-179).—This article is based on 268 records for 1939 kept as part of the farm accounting extension project. The prices used were estimated by the cooperators and averaged about one-half of city retail prices. A table shows the average amounts of different farm products used by 51 to 284 families during different years 1929 to 1939 and also the total value of the products.

The average size of the 268 families was 3.3 adults and 1.6 children under 16 yr. of age. The value of the home-grown produce used by the household ranged from \$78 to \$761, averaging \$293.09. The house rental charge ranged from \$19.50 to \$564, averaging \$193.80. The average values of products and rental charges were \$284.61 and \$220.17 for 161 southern Michigan farms, \$305.36 and \$159.36 for 60 Lower Peninsula farms, and \$306.63 and \$144.72 for 38 Upper Peninsula farms.

Wheat in the post-surplus period 1900-09 with recent analogies and contrasts, H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 17 (1941), No. 7, pp. [2]+315-386, figs. 19).—The wheat-surplus period of the 1890's was followed by a decade characterized by extremely heavy wheat output. In per capita terms, this output was larger than that responsible for the burdensome surplus stocks of the midnineties or that later associated with the depressing surplus of 1928-35, but the early years of this century witnessed no piling up of surplus stocks comparable with the accumulations of 1892-96 and 1929-35. In the absence of burdensome wheat stocks, the purchasing power of British import wheat, trend considered, was moderate rather than low during 1898-1900. Except in 1898-99 and 1901-02, deflated prices of such wheat reflected reasonably well the wheat commodity position of each of the crop years considered. Since 1938 the world's wheat output has again been heavy, and existing wheat stocks are unprecedentedly large. These might conceivably be reduced to normal by 2 successive years of abnormally low yields per acre, reduction in wheat acreage, or prompt expansion of wheat consumption following an early peace, but no prospect is seen probable to bring stocks to a normal level by 1943.

RURAL SOCIOLOGY

[Investigations in rural sociology by the Iowa Station] (*Iowa Sta. Rpt.* 1940, pt. 1, pp. 232-233, 260-263).—Brief results are included on changes in the farm population of Iowa, and old age assistance in Iowa, both by R. E. Wakeley; factors determining the effectiveness of rural organizations in selected Iowa counties, by Wakeley, C. A. Anderson, and W. H. Stacy; and the rural family and the social adjustment of its members, by Anderson and Wakeley.

Historic records bearing on agricultural and grazing ecology in Utah, G. STEWART. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 362-375, figs. 9).—Historic records indicate that as a whole Utah's early settlements were founded according to plan. Usually the quality and depth of the soil and the irrigation water were examined, notation was made of the kind and amount of forage for livestock, and the availability of timber for fuel and buildings was considered. Attention was also paid to the presence of range forage in the mountains for summer use, around the settlements and nearby hills for spring and fall, and in the more distant "desert" areas for winter range. Most of the original settlement sites were so wisely chosen that they became permanent, stable communities, but a few lacked a large body of good soil

ancient water, or had trouble from flood run-off. Many of the later settlements were on sites inferior for cultivated crops and depended largely on forage and livestock raising. When the grazing resources of such communities deteriorated from long severe use, they demonstrated by their inability the need for more careful consideration of what constituted the carry balance in resources for successful, permanent settlement.

Cotton plantation laborers: A socio-economic study of laborers on cotton plantations in Concordia Parish, Louisiana, S. E. GUESBY and H. HORRER (*Louisiana Sta. Bul.* 328 (1941), pp. 40, figs. 5).—This is a study of the social and economic conditions of Negro farm laborers in a typical cotton-producing parish in the Delta area of the Mississippi River. The large cotton plantations continue today in the same areas of Concordia Parish that had slaveholdings and large cotton plantations in 1860. The parish is characterized by a high percentage of tenancy, a heavy proportion of Negroes, and a very high degree of concentration in land ownership. More than 90 percent of the farm laborers were born either in Louisiana or across the line in Mississippi. Fewer were 65 yr. of age or over than in the total Negro population of the parish or the Negro population of the State, and more of the laborers from 20 to 34 yr. than in these other classifications. The Negroes who were slightly more than three-fourths of the population of the parish cooperated with the whites in numerous community activities, particularly those of commercial nature. Of the various community activities religion is the most important, claiming 92 percent of the Negro farm laborers in the parish. The amount of labor employed on the cotton plantations fluctuates markedly from season to season. During the slackest months the number of laborers employed averaged 6 per plantation, while during the busiest months it rose to 10. The cotton plantations offer approximately 26 weeks of employment during the crop and harvest season. The average length of harvest employment is 10 weeks and of crop season employment 16 weeks. The Negro farm laborers had held, on the average, two wage-paid jobs during the preceding

year. The total average annual cash income for Negro males from all sources, including the earnings of dependents, was \$178. One-half of them made \$150 or more, a third from \$150 to \$200, and the remainder (15 percent) upwards of \$250. A larger portion of the laborers had an income of less than \$150 from agriculture. The median income from this source was \$81. No relationship appears between size of income and education.

The contrasts in white women employees in garment plants located in two types of communities of Mississippi, D. DICKINS. (*Miss. Expt. Sta. Bul. Sociol.* 5 (1940), No. 4, pp. 427-437).—Data concerning the type of women employed in three garment plants of Mississippi, located in a village of about a town of 5,000, and a city of 20,000 inhabitants, were examined for the purpose of determining the possibilities and handicaps in the decentralization of industries employing women. Information was obtained by schedules filled out at the plant, supplemented, when necessary, by personal interviews from 1931, and 334 women in the village (1938), city (1939), and town (1937) respectively.

In the analysis of the data obtained, the author concludes that "decentralization of industry can make a fine contribution by giving jobs to more mothers and young wives of nonowner farmers. Yet industry will not take of this group until they have more training. The higher the percentage of Negroes in a county, the greater will be the difficulty of getting industries established, yet the greater will be the need. . . . Industries do not seem to offer

many possibilities for certain groups of women in rural areas. The wife, young children, cannot leave home; the middle-aged woman is not wanted woman on the out-of-way farm is confronted with the transportation problem. The solution for most of these is in more work opportunities for husbands, sons, or in rural industries employing men and boys. Many women in groups need training, such as adult education programs can give, train to earn at home. Perhaps through handicrafts or quality foods, learning to produce some one thing well and finding a market for it, will come the possibilities."

Adolescents' dislikes regarding parental behavior, and their significance. L. H. STORR. (Nebr. Expt. Sta.). (*Pedag. Semin. and Jour. Genet. Psychol.*, 57 (1940), 2. half, pp. 393-414).—This paper and the one noted below represent further studies of particular items in the investigation previously noted whole (E. S. R., 82, p. 140) and concerning special phases (E. S. R., 82, p. 140). In terms of all the group comparisons considered in combination, a direct relationship was shown between the seriousness of the parental faults observed and the degree of correlation with the personality scores of the child. It is suggested that the differences between the city and farm groups, particularly in the comparison of the boys, represent a cultural difference in general attitude toward parents.

Home punishment of adolescents. L. H. STORR. (Nebr. Expt. Sta.). (*Pedag. Semin. and Jour. Genet. Psychol.*, 57 (1940), 2. half, pp. 415-428).—The questionnaire data from the investigation noted above dealing with actual punishment and attitude toward punishment of adolescent boys and girls in farm, town, and city home situations are analyzed and discussed with relation to general differences between farm life and life in the town or city.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Modern agriculture. W. E. GRIMES and E. L. HOLTON (*Boston and London: Ginn & Co.*, [1940], rev. ed., pp. IX+646, figs. 378).—This revision of the book (E. S. R., 68, p. 122) brings the subject matter, references, and statistics up to date. The teaching units have been increased to 25 by setting up separate units the work on horses and mules and beef cattle, dairy, swine, and sheep industries previously included under livestock production on the farm.

Introductory foods. O. HUGHES (*New York: Macmillan Co.*, 1940, pp. 522, figs. 89).—This text is designed primarily for use in freshman and sophomore courses in which little background in chemistry is required and in which fundamentals are illustrated largely by demonstration experiments rather than experimental work by the student. Part 1 deals with the nutritional and economic aspects of the study of foods; part 2 with composition and nutritive value of foods, theories and technics of food preparation, and pertinent buying and part 3 with the planning and serving of meals. Under 2, the proteins, fats, foods, fruits, vegetables, milk, and eggs, are considered first; other chapters deal with meat and meat cookery, poultry, and fish; carbohydrates and hydrate cookery; gelatin; fats and oils; salads and salad dressings; frozen and frozen desserts; beverages; batters and doughs; food preservation and frosted foods.

Leaders on the land: A report of cooperative extension work in agriculture and home economics in 1939. C. W. WARBURTON and R. B. CULLEN. (*U. S. Dept. Agr., Ext. Serv. Rpt.*, 1939, pp. II+39).—This annual report discusses the work done in bringing the results of research to farmers, promoting better farm life, and training boys and girls through 4-H Clubs. The

fluences of different types of work are discussed and examples given of accomplishment.

Tables summarize the extension activities and influences during the year and show by States the number of counties with county extension agents July 1, 1915, 1925, 1935, and 1939. Another table shows by States the total expenditures for cooperative extension work for the year ended June 30, 1939, by sources of funds and the total expenditures by years 1934 to 1938, inclusive.

FOODS—HUMAN NUTRITION

Nutrition [studies by the Hawaii Station] (*Hawaii Sta. Rpt. 1940, pp. 58-62, figs. 2*).—Progress is reported (E. S. R., 83, p. 562) on chemical analyses and vitamin assays of macadamia nuts, by C. D. Miller and L. Louis; on determinations of the vitamin B₁ content of yeast grown on molasses, by Miller and T. T. Kimura; on vitamin assays of a number of vegetables used chiefly by the Filipinos in Hawaii, by Miller, Louis, and Yanazawa; on analyses and vitamin assays of Hawaiian-grown new potatoes, by Miller, Louis, and Kimura; on mechanical tests of vitamin A deficiencies, by M. Potgieter; and on family living studies, by Potgieter and Kimura, in extension of earlier work with regard to dietary habits of various racial groups and the dental defects of the children of these families.

[Studies in foods and nutrition by the Iowa Station] (*Iowa Sta. Rpt. 1940, pt. 1, pp. 72-73, 196-201*).—The work covered by these progress reports, representing an extension of studies noted previously (E. S. R., 82, p. 845), includes canning trials by different methods of two varieties of vegetable soybeans at two stages of maturity, by C. P. Wilsie, P. M. Nelson, and B. Lowe (pp. 72-73); palatability studies of poultry, by Nelson, Lowe, and H. L. Wilcke (p. 200); studies of the conditions influencing the production of uniform experimental animals in the rat stock colony, biological values of autoclaved pork muscle, dietary factors in the production and cure of toxemic pregnancies induced by the feeding of certain pork diets, modifications in the blood, urine, and tissues of rats affected with pregnancy disorder induced by feeding diets containing pork, and dietary factors related to the incidence of gastric ulcers in the rat, all by P. P. Swanson and Nelson (pp. 196-198, 200-201); and certain phases of the cooperative project on the nutritional status of college women as related to their dietary habits, by Nelson and M. A. Ohlson (pp. 198-200).

[Foods and nutrition studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1940, pp. 58-59, 61-62*).—Additional proximate analyses and refractive analyses of the oils (E. S. R., 83, p. 126) are reported for piñon nuts (*Pinus edulis*) from New Mexico and Arizona, for the single leaf piñon nut (*P. monophylla*) from Nevada and Utah, for *P. quadrifolia* from California, and for different varieties of pecans from New Mexico, Arizona, Texas, and Louisiana. A preliminary report is given on the iron content of raw and cooked pinto beans from different localities in the State.

Effectiveness of heat penetration in meat canned in glass jars in a pressure cooker, C. I. NELSON and D. KNOWLES. (N. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 10, pp. 753-759, figs. 5*).—The authors employed a method previously described (E. S. R., 82, p. 556), but used glass jars instead of tin cans. They found the maximum point of efficiency in heat penetration in home-type packs of beef in quart jars to be reached at approximately 90 min. This represents a penetration efficiency of less than 50 percent. They conclude that "the home-canning of beef in glass jars in a pressure cooker

apparently is safe if the pack is preheated to 50° C. and processed 90 min. at 15 lb. steam pressure."

Cooking-quality preferences for potatoes, A. HOTCHKISS, M. WOOD, and P. FINDLEN. (Cornell Univ.). (*Amer. Potato Jour.*, 17 (1940), No. 10, pp. 253-261).—According to preferences expressed by a large number of consumers and retailers interviewed in Cleveland, Ohio, and Rochester, N. Y., in the seasons 1930-37 to 1938-39, mealiness and whiteness were the cooking qualities considered most desirable, although blackening caused more dissatisfaction than sogginess. The general preferences of both homemakers and institution buyers were supported by judges who rated cooking quality of market samples.

Utilization of dried egg whites in bakery products, B. M. WATTS and C. ELLIOTT. (Univ. Calif.). (*Cereal Chem.*, 18 (1941), No. 1, pp. 1-9, fig. 1).—A comparison was made of the characteristics and performance of egg white in the form of (1) fresh white, (2) laboratory-dried white prepared from the fresh by drying on porcelain plates at 45° C. in a vacuum oven, (3) fermented flake albumin, and (4) a commercial dried white prepared by acid treatment, followed by spray drying. Used in meringues where extensibility and heat coagulability of the protein were of minor importance, the commercial samples of white were found to whip better, giving greater volume with less drainage, and to result in more satisfactory meringues than the fresh white or vacuum-dried material. The increased whipping ability of the commercial whites is believed to be due to the partial hydrolysis brought about by the special treatment (fermentation or acid treatment) given them before drying. In all batter and dough products, however, the commercial treated whites were greatly inferior to fresh or laboratory-dried whites. Pop-overs made with the commercial whites failed to pop, cream-puff shells were smaller, poorly browned, and heavy walled, and angel food and whole-egg sponge cakes were smaller in volume and of heavy compact texture as compared with satisfactory products made with the fresh or vacuum-dried egg white. The inferiority of commercial whites was traced to their low pH and decreased amount of heat-coagulable protein. Laboratory-dried (untreated) white was found to be only slightly inferior to fresh white for baking. A simple baking test utilizing a pop-over batter is proposed for determining the suitability of dried whites for batter and dough products.

A presumptive test for the oral contamination of drinking utensils, L. A. DICK and G. J. HUCKER. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 307-313).—The presence of *Streptococcus salivarius* on the rims of drinking glasses is reported as a presumptive test which indicates previous contamination of such utensils. A study of 100 controlled cases indicated that without exception *S. salivarius* was deposited on the rims of glasses during use, and when not cleaned or sterilized these organisms survive on the rims for at least 48 hr. The procedure for making such a presumptive test is outlined.

The American and his food: A history of food habits in the United States, R. O. CUMMINGS (Chicago: Univ. Chicago Press, 1940, pp. XI+267. [pls. 4, figs. 8]).—This book presents a systematic account of food habits of the American people during the past century, with particular endeavor to indicate the effect of social and technological forces on the national diet. Work dealing with production, distribution, preparation, and physiological aspects of food served as source material, which was selected from many agencies, including both the Federal Government and the experiment stations. As the book deals primarily with food habits, no attempt was made to give an exhaustive account of the development of the science of nutrition. The numerous

graphic references are cited by footnote and included by author citation in index.

Family food consumption and dietary levels: Five regions. Farm series. STIEBELING, D. MONROE, C. M. COONS, E. F. PHILPARD, and F. CLARK (*U. S. Agr., Misc. Pub. 405 (1941), pp. 11+393, figs. 10*).—This report, one of a series covering consumption by income (*E. S. R.*, 84, p. 856), deals with the food of farm families in 66 selected counties in the five regions surveyed as part of the consumer purchases study. The relationships between income and family composition; the money value of food, both farm-furnished and purchased; programs of food production for household use; and the quantities of different types of food consumed are given consideration. The basic data, obtained through personal interview with families, are summarized in the appendixes. This report also discusses the nutritive value of farm family diets and their probable adequacy from the nutritional viewpoint.

Are we well fed? H. K. STIEBELING (*U. S. Dept. Agr., Misc. Pub. 430 (1941), pp. 21+28, figs. 14*).—This report presents in popular form information on the content, cost, and nutritional adequacy of diets of the Nation's families. It is based on studies of family food consumption noted in part in Circular 507 (*E. S. R.*, 81, p. 142) and above.

The need of milk in the South, O. D. ABBOTT. (Fla. Expt. Sta.). (*Jour. of Technol.*, 3 (1940), No. 6, pp. 354-356).—A paper presented at a meeting of the International Association of Milk Sanitarians.

Nutrition and the war, G. BOURNE (*Cambridge, Eng.: Univ. Press, 1940, pp. 1+126*).—A practical feature of this attempt to help "the [British] layman understand the problems of nutrition at a time when such knowledge will be very valuable to him, and to help him choose alternative foods when some foods become too expensive to purchase or even impossible to obtain" is a classified list (A) of foodstuffs with their percentage composition of proteins, fats, and carbohydrates and their general appraisal as sources of iron, phosphorus, and calcium, and the vitamins A, the B group, C, D, and E, together with another list (B) giving the best sources of these food constituents.

The doctors tell you what to eat in war time (London: Brit. Med. Assoc., 1940).—This booklet has been prepared by a committee of experts appointed by the British Medical Association to examine the problems of diet in wartime, especially in relation to rationing. Nutritive needs are grouped under the headings for warmth and energy, the need for growth and repair, and the need for protection against disease and the preservation of health, and the best means for meeting these needs in time of food shortage are discussed in simple language for the use of the ordinary man and woman of the home, with special mention to the former that "war means a change in the bill of fare."

Substitute for edestin, H. B. VICKERY, E. L. SMITH, and L. S. NOLAN. (Conn. [New Haven] Expt. Sta.). (*Science*, 92 (1940), No. 2388, pp. 317-318).—It is suggested that the globulin of the pumpkin seed (*Cucurbita pepo*) may be used to fulfill most of the requirements of a substitute for hempseed edestin, which is virtually unavailable because of the drastic restrictions upon trade in hempseed effected through passage of the Marihuana Law of 1937. Pumpkin seed, a waste product of the canning industry, is available at low cost, and preliminary investigations showed that a well-crystallized globulin may be obtained from the whole seed by grinding, treating with 10 percent NaCl solution and extracting by means of a hydraulic press. After removal of the fat by solution and dilution of the filtered aqueous phase to about 2 percent NaCl solution, the solution was allowed to cool slowly to about 5°, whereupon the globulin deposited in octahedral crystals. Recrystallization by the same process

gave a fine product in about 10 percent yield. Proteins from the com available cucurbit seeds showed minor differences in behavior, but all well-crystallized globulins.

Eating habit and fasting metabolism of rats, M. KLEBER and A. H. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 630-4. Rats previously kept for 4 days on a regime in which the daily food ration given at one time were found to have essentially the same fasting metabolism as similar animals given their daily food in five equal portions at 4-hr. intervals during the 4 preliminary days. The mean heat production (Cal. per $\text{kg}^{3/4}$) was 78.3 ± 2.3 and 78.2 ± 2.3 in the two groups, respectively. In measurements of the fasting metabolism it is thus sufficient to equalize previous daily rations between experimental and control rats without regard to their feeding habits.

The emptying time of the normal human stomach after the administration of a bile preparation, E. J. VAN LIERE and D. W. NORTHRUP. (Univ. et al.). (*Amer. Jour. Digest. Diseases*, 8 (1941), No. 1, pp. 26-8. Gastric emptying time determined on four normal subjects given a test meal of 15 gm. of farina cooked to 200 cc. and containing 50 gm. of added sodium sulfate was found to average 2.01 hr. The individual times, the average of four determinations on each subject, ranged from 1.75 to 2.25 hr. Following the ingestion of a therapeutic dose of 0.5 gr. (0.42 gm.) of dehydrocholic acid in 100 cc. of water 10 min. before the test meal, the emptying times varied from 1.50 to 1.89 hr., averaging 1.58. This constituted an average decrease of 21 percent in the gastric emptying time of the four individuals; the experimental range ranged from 14.2 to 33.3 percent.

Non-availability of gum acacia as a glycogenic foodstuff in the rat, MONKE. (Univ. Md.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 178-179).—Fasting young male rats were used. Animals in the control group were given 10 gm. of cacao butter, while those in the experimental group received 10 gm. of a mixture of 34 percent of white powdered gum acacia and 66 percent of cacao butter. At the end of 72 hr. the animals were anesthetized with sodium amytal administered intraperitoneally, and the livers were immediately extirpated and analyzed for their glycogen content. Glycogen in individual livers varied from 0.03 to 0.29 percent in the control group, from 0.04 to 0.31 percent in the acacia-fed groups. These results indicate that the orally administered gum acacia was excreted unchanged in the feces, indicating that no part of the gum acacia molecule was subject to disintegration by the enzymes of the digestive tract of the rat.

A comparison of the metabolism of iodine and of element 85 (radioiodine), J. G. HAMILTON and M. H. SOLEY. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 8, pp. 483-489, fig. 1).—Element 85, produced by bombardment of a water-cooled metallic bismuth target with 32,000,000 electron-volts alpha-particles, and radio-iodine (I^{131}), produced by the bombardment of tellurium with 16,000,000 electron-volts deuterons, were obtained by distillation, outlined, and finally taken up in 0.016 N sodium thiosulfate. Equal quantities of radio-iodine and element 85, which had previously been made isotonic by the addition of sodium chloride, were administered together by subcutaneous injection to normal and to thyrotoxic guinea pigs. The animals were sacrificed at intervals (4, 18, 65 hr.), and the uptake of the elements in the thyroid glands, blood, liver, lymph nodes, and muscle was determined, as were the amounts excreted in the urine and feces after 4 and 18 hr. The results recorded show that element 85 is retained in the thyroid tissues and excreted in a manner similar to the radio-iodine. With both elements the

taken up by the thyroid glands in the thyrotoxic animals was greater than in the normal animals. The contents of the two elements in other tissues examined were found to be less than 1 percent of their concentration in the thyroid gland. This similarity of the two elements in selective concentration by the thyroid gland and in rapidity of excretion is considered as further evidence that element 85 is a halogen. Its possible therapeutic value in cases of hyperthyroidism is discussed.

Blood volume in cobalt polycythemia, J. E. DAVIS. (Univ. Vt.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 671-673, fig. 1).—Doses of cobaltous chloride amounting to 2 mg. of cobalt per kilogram of body weight were administered in dilute solution by stomach tube to 3 dogs daily for 12 days. Erythrocyte counts, hemoglobin percentages, and measurements of blood volume and cell volume, before and after administration, showed that the polycythemia which developed was accompanied by an increase of blood volume which was due chiefly to an increased volume of cells.

The distribution of the "grass juice factor" in plant and animal materials, S. B. RANDLE, H. A. SOBER, and G. O. KOHLER. (Wis. Expt. Sta. et al.). (*Jour. Nutr.*, 20 (1940), No. 5, pp. 459-466, fig. 1).—A considerable number of animal and plant tissues were examined to determine the relative distribution of the grass juice factor, as indicated by the growth responses of guinea pigs (275-325 gm.) receiving the materials as supplements to a basal diet of fresh unpasteurized winter milk supplemented with Fe, Cu, and Mn at respective levels of 1 mg., 0.1, and 0.1 mg. per day. The feeding technic described by Kohler et al. (*U. S. R.*, 79, p. 667) was used. For the most part food materials were fed in the air-dry state at levels of from 2 to 5 gm. daily.

As judged from the average daily weight gain of the animals, dehydrated cereal grass (*Cerophyl*), ryegrass, young white clover, peas, pea shells, cabbage, turnip tops, sprouted oats, and spinach were the best sources. Apples, celery, molasses, peanuts, turnips, lettuce, oats, egg, beef heart, and whole and skim milk powder were the poorest in this factor. Other plant and animal tissues tested were found to be intermediate sources. These and previous results suggested that animal tissues are a poor source of the grass juice factor, and that young rapidly metabolizing plant tissues are much richer in this growth-promoting substance than mature plant tissues. Careful drying and storage apparently had little effect on the original activity of the materials thus treated. Ashing of the *Cerophyl* or treatment with hydrogen peroxide destroyed all activity; treatment with water, dilute KCN, or NaOH did not effect destruction of the factor. Glucuronic acid, narcotine, citrin, and specific fractions of citrin (hesperidin and calcium eriodictate) did not have the activity of the grass juice factor.

Anticataractogenic action of certain nitrogenous factors, H. S. MITCHELL, G. M. COOK, and M. D. HENDERSON. (Mass. Expt. Sta.). (*Arch. Ophthalmol.*, 24 (1940), No. 5, pp. 990-998, figs. 3).—In extension of earlier studies in which it was shown that rations high in protein delayed and rations low in protein hastened the onset of galactose cataract in rats (*U. S. R.*, 80, p. 850), the previous findings with respect to proteins have been verified, and tests with various nitrogenous factors have indicated that the protective agent may be some specific amino acid or group of amino acids.

That the protective effect of protein might be due to adsorbed vitamins was ruled out by the identical results obtained when vitamin-free casein was used in place of commercial casein and by earlier observations showing the ineffectiveness of either thiamin chloride or riboflavin (*U. S. R.*, 80, p. 850). Paired feeding of casein and a casein enzymic hydrolysate at equivalent nitrogen levels gave

practically the same results, suggesting that the activity might be located in some derivative of protein hydrolysis or metabolism. The sulfhydryl amino acids, cystine and methionine, and the simpler nitrogenous compounds, urea and choline, proved ineffective. Deaminized casein was more protective and heated casein less effective than commercial casein. Since both have been shown to retard growth, it is concluded that the factors necessary for growth promotion and cataract inhibition are not the same. It is suggested that the protective action is in some way concerned with the lens or its capsular membrane, and the question is raised as to the possibility that the same factor may exert a similar function against other injurious agents and in other mammalian species.

The effect of dry heat upon the anticataractogenic quality of certain proteins. M. D. HENDERSON and H. S. MITCHELL. (Mass. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 115-124).—Continuing the search for the nature of the protective factor in protein against galactose cataract in the rat, the authors have studied the effect of prolonged exposure to dry heat upon casein, egg albumin, wheat gluten, and beef fibrin. The paired feeding technic was used, and the 4 proteins were fed at a 15 percent level as purchased and after heating for 96 hr. in thin layers at 125° C. The galactose was given at a 25 percent level.

The growth values of the proteins were decreased by heat treatment in the order gluten, casein, fibrin, and egg albumin, and the anticataractogenic property in the order casein, egg albumin, gluten, and fibrin. The difference in order of effects confirms the observation noted above that the protective agent against cataract is not the same as that essential for growth.

The blood sugar values of all of the rats receiving galactose were pathologic and were higher on the heated than on the unheated protein. These differences were statistically significant between the plain and heated casein but questionable between the raw and heated egg albumin.

The possibility is suggested that the extent of fluctuation of blood sugar may be injurious rather than the absolute level reached after a given amount of a galactose-containing ration has been consumed, and that the observed protective action of protein must be exerted either by lowering the level of the injurious factor in the blood or increasing the resistance of the membrane of the lens capsule. The latter hypothesis is favored, although the degree of galactemia is thought to be a contributing factor.

The effect of the hydrolytic products of casein and deaminized casein on the cataractogenic action of galactose. E. L. MOORE, M. D. HENDERSON, H. S. MITCHELL, and W. S. RITCHIE. (Mass. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 125-133).—This paper extends the observations of Mitchell, Cook, and Henderson, as noted above, on deaminized casein and its hydrolytic products. Large batches of commercial casein and deaminized casein were subjected to both acid and enzymic hydrolysis and the hydrolyzates fractionated quantitatively into the major amino acid groups. A larger percentage yield of monoamino acids was obtained from casein than from deaminized casein by both methods of hydrolysis, suggesting incomplete hydrolysis of the deaminized casein to the free amino acids. This hypothesis was borne out by a relatively large yield of diamino and dicarboxylic acids from the deaminized casein. The fractions, deposited on cornstarch, were incorporated in the 25 percent galactose rations in amounts to replace about two-thirds of the casein in the 15 percent protein diet. The paired feeding technic was followed with controls on casein and deaminized casein.

Of the various fractions tested, the enzymic hydrolyzate of the deaminized casein proved somewhat more protective than the deaminized casein from which

it was prepared, most of the other fractions showing complete lack of protective action. Of the fractions of this hydrolyzate, the diamino dicarboxylic acids gave as much protection as the whole hydrolyzate and the monoamino acid and proline and peptide fractions no protection.

In general the blood sugars remained high and did not vary consistently with the rate of development of cataract, thus giving further support to the belief expressed above that the protective action is a local effect on the lens or lens capsule rather than an effect upon the sugar metabolism.

The coupled oxidation of carotene and fat by carotene oxidase, J. B. and R. J. SUMNER. (Cornell Univ.). (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 531-533, fig. 1).—Carotene oxidase, an enzyme occurring in the water extract of fat-free soybean meal, was found to bleach carotene with extreme slowness unless a small amount of fat was present. With a small (optimal) amount of fat the bleaching was exceedingly rapid, but with excessive quantities of the fat the rate of bleaching diminished. Bixin from annatto acted like carotene. Highly unsaturated fats like hempseed oil or soybean oil were more effective than olive oil or butter. The bleaching action of the enzyme is considered as probably an instance of a coupled reaction.

The relation of thiamine to citric acid metabolism, H. A. SOBER, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 605-616, figs. 3).—Studies of the excretion of citric acid by rats during thiamin deficiency are reported, indicating a decreased excretion during acute deficiency independent of the inanition accompanying the deficiency. A decreased ability of the rats to transform injected succinic acid into citric acid was also shown. When thiamin was administered to depleted rats, a tenfold increase in citric acid excretion was observed in from 4 to 6 days, followed by a slow decrease to normal levels in from 10 to 14 days after initiation of the therapy. The evidence is thought to demonstrate that thiamin is essential for the synthesis of citric acid.

The influence of dietary riboflavin on the content of this vitamin in chicken tissue, A. Z. HODSON. (Cornell Univ.). (*Jour. Nutr.*, 20 (1940), No. 4, pp. 377-382).—Chicks fed for 6 weeks on a diet containing 6.9 μ g. of riboflavin per gram of feed were found, upon analysis by the fluorometric method of Hodson and Norris (*E. S. R.*, 83, p. 151), to have a higher content of riboflavin than chicks fed for a similar period with the basal diet containing but 1.0 μ g. of riboflavin per gram. Liver, heart, gizzard, leg (dark meat), and breast (light meat) averaged, respectively, per gram of fresh tissue 11.2, 4.3, 1.3, 1.0, and 0.4 μ g. of riboflavin for chickens on the low-riboflavin diet, and for birds on the high-riboflavin diet 32.9, 18.4, 4.1, 4.2, and 0.8 μ g. On the basis of the dry tissue these values were calculated as 41, 19.4, 4.0, 4.2, and 2.0 μ g per gram for the former group and 111, 71.2, 14.5, 17.0 and 3.1 μ g per gram for the latter group. The results of determinations on two samples of spleen, two of eye, and one each of lung, comb, and brain from the chickens receiving the excess of riboflavin indicated that per gram of dry tissue these tissues contained, respectively, 23.2, 16.4, 26.5, 6.4, and 28.0 μ g. of riboflavin. Leg and breast tissues from five birds fed a commercial diet averaged, respectively, 9.3 and 3.6 μ g.

Riboflavin content of blood and muscle in normal and in malnourished humans, A. E. AXELROD, T. D. SPIES, and C. A. ELVEHJEM. (Univ. Wis. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 146-149).—In this comparison 5-cc. blood samples were obtained by venepuncture, with potassium oxalate as anticoagulant, from 35 patients with varying degrees of riboflavin deficiency and from 20 normal controls. Muscle samples were also obtained

by biopsy from 30 patients with varying degrees of pellagra and interrelated vitamin deficiencies, presumably including riboflavin deficiency, and from 9 patients with normal nutrition. As determined by the microbiological method of Snell and Strong (*E. S. R.*, 82, p. 587), the blood riboflavin values of the normal subjects ranged from 0.35 to 0.45 $\mu\text{g.}$, with an average value of 0.42 $\mu\text{g.}$ per cubic centimeter. The values for the patients with clinical symptoms of riboflavin deficiency were in the same range, with an average of 0.40 $\mu\text{g.}$ Values for the muscle tissues of the normal subjects ranged from 2.2 to 3.5 $\mu\text{g.}$, with an average of 2.9 $\mu\text{g.}$ per gram of fresh weight. Values for the 30 pellagrins were within the same range, with an average of 2.8 $\mu\text{g.}$ per gram. It is concluded that determinations of blood and muscle riboflavin values are of little significance in evaluating riboflavin deficiency in human beings.

The riboflavin content of blood and urine, F. M. STRONG, R. E. FEENEY, B. MOORE, and H. T. PARSONS. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 363-372).—"The present paper reports a study of, first, the applicability of the bacterial method of Snell and Strong [*E. S. R.*, 82, p. 587] to blood and urine, second, some observations on the amount of riboflavin found in the blood and urine of human adults and of several animal species, and third, the effect of varied intake on the urinary excretion of riboflavin by the human." With blood, reproducible values were obtained for samples of not over 0.2 cc. per tube titrated with bromothymol blue solution of five times the usual strength as indicator. Assays on 10 samples of blood obtained over a 6-week period from a single subject gave values ranging from 0.40 γ to 0.54 γ , with an average of 0.47 γ per cubic centimeter, respectively. Recoveries of riboflavin added to samples of whole blood of various species (calf, hog, rat, dog, and human) were for the most part high, especially for animal blood. In 10 samples of human blood the recoveries ranged from 88 to 126 percent.

Riboflavin added at different levels to whole urine was quantitatively recovered. The 24-hr. urinary excretion of riboflavin by a number of adult subjects of both sexes on unrestricted diets ranged from 477 γ to 833 γ . One subject who had eaten approximately $\frac{1}{4}$ lb. of beef liver on the day of the test excreted 2,248 γ of riboflavin. In four young women subjects on a fixed diet supplemented by known amounts of the vitamin, the excretion decreased and increased with corresponding changes in riboflavin intake. On an intake of from 1 to 2 mg. the level decreased rapidly to from 50 γ to 150 γ daily. Blood values for three of the subjects following a lower intake for 2 or 3 days were 0.33 γ , 0.35 γ , and 0.29 γ per gram, respectively. In a miscellaneous series of subjects the ingestion of from 2 to 5 mg. of riboflavin was followed by a prompt rise in excretion, but among several individuals whose excretion of riboflavin was low, the response was delayed or absent.

The authors conclude that a riboflavin intake of 1 or 2 mg. daily "is at best no more than marginal, and perhaps insufficient satisfactorily to supply the daily requirement."

The d-amino acid oxidase content of rat tissues in riboflavin deficiency, A. E. AXELROD, H. A. SOBER, and C. A. ELVEHEIM. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 749-759).—This detailed report substantiates the conclusions drawn in a preliminary report (*E. S. R.*, 83, p. 712) concerning the importance of riboflavin and also of other members of the B complex for the maintenance of normal values of d-amino acid oxidase in the liver and kidney. "When a growth stimulation results from addition of riboflavin alone to a partially synthetic ration deficient in more than one member of the vitamin B complex, further supplementation with other members of the vitamin B complex facilitates the complete synthesis of the enzyme."

Anti-grey hair vitamin deficiency in the silver fox, A. F. MORGAN and H. D. SIMMS. (Univ. Calif.). (*Jour. Nutr.*, 20 (1940), No. 6, pp. 627-635, figs. 3).—This paper reports in detail the observations on achromotrichia (graying of the fur) in silver foxes, summarized in an earlier paper (E. S. R., 84, p. 419), with photographs of the experimental and control animals and their pelts. In the discussion of the work, particular emphasis is given to the early and devastating effect upon the fur of even partial deprivation of filtrate factors and to the survival in the experimental animals of the thymus, as well as the slight but unmistakable damage to the adrenal cortex seen in the same animals. "The question arises as to whether decreased adrenal cortex activity was the primary result of the filtrate factor deficiency with hypertrophied thymus resulting therefrom, as noted in Addison's disease . . . , or whether the thymus is primarily affected. There may be in this a clue to the mysterious role of the thymus and the clinical condition known as 'status thymicolymphaticus.'"

Butter fat in dermatitis-producing diets, H. A. SCHNEIDER. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 266-267).—Attention is called to previous observations of the author and associates (E. S. R., 81, p. 830) that butterfat is a curative agent for rat dermatitis and of György (E. S. R., 75, p. 282) that butterfat can serve as a component of a dermatitis-producing diet. This anomalous role of butterfat is now explained by the results of feeding experiments in which the 9 percent butterfat of a dermatitis-producing ration was fed to young rats in two forms—fresh and rancid. The fresh diet was made up weekly and kept in the refrigerator and the rancid made up 1 mo. before use and kept at room temperature. The rats receiving the fresh diet failed to develop any symptoms of dermatitis after 15 weeks, while those fed the rancid diet developed a florid dermatitis in 6 weeks but were cured in 3 weeks after being changed to the fresh diet.

Effect of synthetic pantothenic acid on adrenal hemorrhage, atrophy, and necrosis in rats, F. S. DART, W. H. SEBELL, S. H. BABCOCK, JR., and T. H. JUKES. (Univ. Calif. et al.). (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 30, pp. 1333-1337).—A further study of the hemorrhagic adrenal necrosis in rats (E. S. R., 83, p. 139) is reported, with the conclusion that a deficiency of pantothenic acid is at least one of the causes of these adrenal lesions. Among 44 rats studied histologically after having been for 52-84 days on the deficient basal diet with or without supplements of pantothenic acid, 10 of 16 untreated animals showed hemorrhage, necrosis, or atrophy of the adrenal glands, singly or combined, and 14 showed marked fat depletion of the adrenals, while only 1 adrenal in 1 of 28 litter mates receiving synthetic pantothenic acid in doses of 100 or 200 μ g. showed any of the pathological lesions, and only 4 showed even moderate fat depletion. In view of the observations of Morgan and Simms (E. S. R., 84, p. 419) that in rats deprived of the antigraying vitamin certain degenerative changes take place in the adrenals, attention is called to the fact that the experimental diet in the present study presumably contained little or no antigraying vitamin.

The effect of administration of pantothenic acid on the histopathology of the filtrate factor deficiency state in rats, L. L. ASHBURN (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 30, pp. 1337-1346, pls. 2).—This report deals with the effect of pantothenic acid on the clinical symptoms and pathologic lesions of rats on the deficient diet used in the study noted above. Microscopic findings are described in detail from the adrenals of untreated (16) and control animals treated with pantothenic acid (31), and more briefly for the spleen, testes, bones, and pancreas.

Pantothenic acid and hemorrhagic adrenal necrosis in rats, W. D. SALMON and R. W. ENGEL. (Ala. Polytech. Inst.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 621-623).—Evidence is presented confirming the findings of Daft et al., noted above, that pantothenic acid from natural sources or in the form of synthetic calcium pantothenate prevents the adrenal hemorrhage and necrosis frequently, although not always, developing in rats on a filtrate factor-deficient diet. The animals, which showed severe necrotic changes in the adrenal cortex on autopsy, failed rapidly on the deficient diet, developed severe hemorrhage rhinitis, and in some cases went into coma before being removed for examination. Microscopic examination of necropsy material showed that the adrenal hemorrhage originated in the inner zone of the cortex without involvement of the medulla. Other pathological signs were abnormal thymic involution, severe pneumonic processes in the lungs, and mild epithelial sloughing of the intraorbital lacrimal glands, with some hemorrhage of the lumen.

The determination of ascorbic acid in evaporated milk, powdered milk, and powdered milk products, W. W. WOESSNER, C. A. ELVEHJEM, and H. SCHEUTE. (Wis. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 4, pp. 327-338).—In the method given reduced ascorbic acid is determined by the procedure previously described (E. S. R., 82, p. 854). The determination of dehydroascorbic acid by slight modifications of that procedure involves treatment of the milk with hydrogen sulfide for 20 min., addition of the modified Willberg reagent, removal of the excess hydrogen sulfide by a vigorous stream of nitrogen, and removal of the curd by filtration. The filtrate, measured into the tube of the photoelectric colorimeter, is treated rapidly with the dye-acetate solution, and galvanometer readings are taken at 15 and 30 sec. by stop watch. Studies to determine the effect of potential interfering substances indicate that heated lactose (as present in evaporated and dried milks), stannous tin (from commercial equipment), and certain water-soluble proteins or protein fractions react with the reagent, but at a rate slower than exhibited by the dehydroascorbic acid. Galvanometer readings extrapolated to zero seconds gave a satisfactory indication of reactivity due to dehydroascorbic acid alone. The reliability of the photoelectric colorimeter is limited by iron, but the quantity of this element in milk and milk products is considered insignificant.

Reduced ascorbic acid and total ascorbic acid are reported for 9 samples of powdered milks and milk products and for 36 samples of evaporated milks. Values for total ascorbic acid in dried milks and products varied from 12.6 to 100.8 mg. per kilogram. Values for the evaporated milks varied from 3.8 to 27.6 mg. per liter, these being equivalent to from 1.9 to 13.8 mg. per liter of milk as diluted for equivalence to normal whole milk. Values for a number of these samples of known history as to manufacturing methods and equipment indicate that the metallic nature of the manufacturing equipment is not the limiting factor which determines the ascorbic acid content of evaporated milk.

Urinary excretion of ascorbic acid by the rat as influenced by ingestion of certain carbohydrates, C. A. FREDERICK, N. B. GUERRANT, R. A. DUTCHER, and C. A. KNIGHT. (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 203-207, fig. 1).—This study was undertaken because of the lack of agreement among various investigators as to the relationship of the composition of the ingested diet to the amount of ascorbic acid stored and excreted by the rat. The plan followed was to place half-grown rats singly in metabolism cages, feed them for several weeks vitamin C-free diets differing only in the type of carbohydrate, and determine the 24-hr. output of ascorbic acid in the urine. In the first series all of the animals were on a diet containing dex-

trinized cornstarch as the carbohydrate for 8 weeks, followed by sucrose for 5, glucose 4, starch 4, and dextrinized cornstarch again for 4 weeks. In subsequent series the order of the carbohydrates was changed, and in a limited number of feeding periods of short duration mannose, sorbose, fructose, and lactose were studied. The urinary ascorbic acid was reported in terms of the average daily output for the entire period on each of the diets.

With all of the animals tested, the ascorbic acid output was greatest on the dextrinized starch whatever the order in which it was fed. In most instances the output was least on glucose, but this appeared to depend somewhat on the order in which it was fed. No satisfactory explanation could be given for these findings.

The ascorbic acid, phosphatase, and calcium content of the blood of guinea pigs with varying degrees of scurvy, E. N. TONHUNTER and W. BREWER. (Wash. Expt. Sta.). (*Amer. Jour. Physiol.*, 130 (1940), No. 2, pp. 310-318).—Ascorbic acid analyses of the blood plasma of all available guinea pigs in the authors' laboratory gave the following average results: On a basal vitamin C-free diet for 13 days, followed by the same diet plus 0.5 mg. of ascorbic acid daily for 21 days (73 animals), 0.16 mg. per 100 cc.; on the same diet plus 2 mg. for 34 days (12 animals), 0.22 mg.; and on 8 mg. for 34 days (10 animals), 0.54 mg. per 100 cc. The difference in values between the first two groups was significant and between the second and third highly significant, the *t* values being 4.962 and 9.119, respectively. This indicates that the ascorbic acid content of the blood plasma of guinea pigs is dependent on the intake.

Simultaneous analyses of plasma ascorbic acid, serum phosphate, and serum calcium were made on three groups of guinea pigs comparable in every way except for the quantity of vitamin C fed and the degree of scurvy produced. These consisted of 8 animals receiving 8 mg. of ascorbic acid daily and free from scurvy, 21 with mild scurvy, and 10 with severe scurvy. The mean values were plasma ascorbic acid 0.57, 0.20, and 0 mg. per 100 cc., respectively; serum phosphatase 17, 21, and 6.8 units per 100 cc.; and serum calcium 13.1, 13.0, and 13.9 mg. per 100 cc., respectively. A repetition of these tests with six pairs of well-matched animals of the same sex, one of each pair with scurvy and the other without, showed that severe scurvy was accompanied by a significant decrease in serum phosphatase values but no appreciable change in calcium values.

Minimum daily requirement of rabbits for α -tocopherol, S. H. EPPSTEIN and S. MORGULIS. (Univ. Nebr.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 715, 716).—Rabbits made dystrophic on the Göetsch-Pappenheimer diet 13, in which the vitamin E is destroyed by oxidation with FeCl_3 and rancid fat, were cured by the daily oral administration of synthetic *dl*- α -tocopherol acetate in quantities ranging from 0.18 to 1.0 mg. per kilogram of body weight. Most cures resulted from doses of 0.2-0.5 mg. (as the free alcohol). In these feeding trials the vitamin E required seemed to vary directly with the amount of the total α -tocopherol intake, thus indicating that the variation in requirement was associated not with individual variability in the need of the tissues, but with variations in the efficiency of absorption, ability for storing, and rate of destruction of the vitamin.

Rabbits made dystrophic on another diet, X113, in which the vitamin E was removed by exhaustive extraction with lipid solvents, were cured by smaller doses of α -tocopherol than were needed with diet 13. With diet X113, the requirement was found to range from 0.15 to 0.60 mg. per kilogram. Preliminary experiments with diet X113, modified to exclude cod-liver oil and include instead percomorph and linseed oils (a few drops of each per week), indicated

that still smaller doses of α -tocopherol might be effective. The present experiments are interpreted as indicating that the rabbit requires from 0.2 to 0.4 mg. of vitamin E per kilogram of body weight to cure and prevent muscle dystrophy, and that the value may be reduced by improved dietetic technic to as low as 0.1 mg.

The newer knowledge of vitamin K, W. D. ANDRUS. (Cornell Univ.). (*Bul. N. Y. Acad. Med.*, 2. ser., 17 (1941), No. 2, pp. 116-134, figs. 6).—A review pertaining particularly to the clinical application of this newer knowledge.

Normal and abnormal prothrombin levels, H. C. MASON. (Univ. Ill.) (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 70-73).—Prothrombin clotting times were determined on 17 adult normal subjects and 94 treated and untreated clinic and hospital patients suffering from unrelated diseases. The data presented indicate that the normal range is from 25 to 30 sec. and that patients with pernicious anemia, pellagra, sprue, and other pathological conditions have similar normal prothrombin values. Abnormal variations sometimes occurred between wet and dry thromboplastin readings. In such cases it is considered probably more accurate to depend upon the whole blood clotting index, since values above 30 sec. were found to give a whole blood index of 1.0+.

Cereals and rickets, X-XII. (Wis. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), Nos. 1, pp. 7-18; 2, pp. 125-132).—In continuation of this series (E. S. R., 81, p. 262) three papers are presented.

X. The availability of phytic acid phosphorus, C. H. KRIEGER, R. BUNKFELDT, and H. STEENBOCK (pp. 7-14).—The present experiments were designed to compare the availability of the phosphorus of phytic acid with that from inorganic sources. A noncereal rachitogenic ration (E. S. R., 81, p. 584), low in phosphorus (0.04 percent) but normal in calcium (0.57 percent) and complete in other respects, was used as the basal ration. This was varied by additions, at the expense of the cerealose, of phytic acid or of a sodium phosphate mixture in amounts to furnish phosphorus at different levels, both in the presence and in the absence of vitamin D. The various phytic acid supplements were sufficient to furnish phosphorus at the optimum level (0.237 gm. per 100 gm. of ration) and at $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{6}$ of the optimum level. The inorganic phosphorus was used at the $\frac{1}{2}$ optimum level. These test rations and negative and positive controls with respect to inorganic phosphorus were fed with and without viosterol supplements to young rats for periods of 14 weeks, or less if the condition of the animals demanded.

Data are tabulated to show the weight and percentage of ash in the femurs of the animals sacrificed at the end of the experiment. These results, substantiated by inspections of the metaphyses and costochondral junctions, indicated that the rats fed this cereal-free ration of normal calcium content were able to utilize the phosphorus from phytic acid in the presence of vitamin D, but in no case was the utilization of phosphorus from phytic acid equal to that of inorganic phosphorus. Since there was this superior utilization of inorganic phosphorus, the increase in utilization as effected by vitamin D was less marked than in the case of phytic acid phosphorus.

XI. Calcium phytate as a source of calcium, C. H. KRIEGER, R. BUNKFELDT, and H. STEENBOCK (pp. 15-18).—The noncereal rachitogenic diet, modified to be normal in phosphorus and low in calcium, was used as the basal ration. In the several experiments young rats were fed for 12-week periods with this basal ration supplemented with calcium phytate or calcium carbonate in amounts sufficient to furnish $\frac{1}{8}$ or $\frac{1}{4}$ of the optimal calcium level (0.428 gm. per 100 gm. of ration), these supplemented rations being fed with and without vitamin D. Data presented on the weight and percentage of bone ash of the

animals of the several groups indicate that the calcium of the calcium phytate was as readily available to the rat as that from calcium carbonate, and that vitamin D improved the utilization of both forms of calcium to the same extent.

XII. *The effect of calcium and vitamin D on the availability of phosphorus*, C. H. Krieger and H. Steenbock (pp. 125-132).—The basal ration, essentially the same as that used in the above studies, was modified by a change in salt mixture to contain but 0.04 percent of phosphorus and 0.2 percent of calcium. For the experimental diets the phosphorus was brought to the optimal level by the addition of either phytic acid or inorganic phosphates in the form of a neutral mixture of anhydrous mono- and dipotassium salts, and calcium was added as precipitated calcium carbonate, anhydrous calcium chloride, or hydrated calcium sulfate ($2\text{H}_2\text{O}$) to give approximate calcium:phosphorus ratios of 0.5:1, 1:1, 2:1, 4:1, and 6:1. One ration containing phytic acid phosphorus and another inorganic phosphorus, both without calcium, were fed as negative controls. The various rations were fed with and without vitamin D (45 U. S. P. units per 100 gm. of ration). Paired feeding techniques were used, and after 3 or 4 weeks the rats were taken for analysis. The effect of calcium, with and without vitamin D, on phosphorus availability at the various calcium:phosphorus ratios was judged by food consumption, weight increases, weight of bone and ash, and percentage of bone ash.

The results indicate that with an optimal intake of phosphorus and a calcium:phosphorus ratio of 1:1 calcium was apparently the limiting factor, and that the phytic acid phosphorus was almost as readily utilized as the inorganic form. With an increase in the calcium:phosphorus ratio to 2:1 the phosphorus became the limiting factor and here the availability of the phytic acid phosphorus was markedly decreased, this decrease becoming more pronounced with further increase in the calcium:phosphorus ratio. On the other hand, utilization of the inorganic phosphorus was not markedly affected by an increase in calcium even up to a ratio of 6:1. Variations in the source of the calcium produced small but consistent differences in calcification. Calcium chloride, the potentially acid salt, produced more severe rickets than either the carbonate or the sulfate and calcium sulfate tended to produce more bone ash than calcium carbonate. Vitamin D improved the utilization of both forms of phosphorus, the effect being less pronounced with the inorganic phosphorus because of its superior utilization as compared with that of phytic acid phosphorus, even without vitamin D.

Tensile strength of tibiae of healed rachitic and normal rats, A. A. SCHILLER and H. C. STEUCK. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 198-200).—This preliminary investigation was undertaken to determine whether any loss in bone strength was associated with the loss of longitudinal orientation of the crystal micelles of the inorganic material, as observed in rachitic and healed rachitic rat tibiae. Thirty rats from 5 litters were divided equally into control and experimental groups. The control animals were placed at weaning on the stock diet, while the experimental animals were made severely rachitic by keeping them for 41 days on the Steenbock-Black rachitogenic diet. The lesions were then healed by giving the animals 250 units of calciferol by mouth and continuing them on the stock diet for 6 weeks.

After freeing from soft tissues, the strength of each tibia was determined by the use of a recording apparatus that measured the deflection of the bone under a weight applied to the bone as supported on two blunt knife edges 1 cm. apart. The data showed that the difference in breaking weight between the healed

rachitic and normal bones was, in the case of the male animals, $3.52 \times$ the standard deviation, and in the case of the females, $3.59 \times$ the standard deviation. It is pointed out that the array of results formed a somewhat skewed distribution curve, but that the differences in tensile strength between the roentgenologically healed bones and the controls were probably significant.

Effectiveness of the sunlight in Tucson, Arizona, for the prevention or cure of rickets. M. C. SMITH, N. SAYRE, and E. BLANCHARD (*Arizona Sta. Tech. Bul.* 90 (1941), pp. [2]+169-195, figs. 8).—This bulletin reports the results of a detailed investigation involving prevention and cure of rickets in various groups of rats by exposure to sunlight or "skyshine" for different periods at different times of the day in each month of the year. The effectiveness of the solar rays was judged by line test results.

A seasonal fluctuation was observed in the exposure required for complete protection against rickets. Minimal exposures of from 1 to 2.5 min. sufficed in June, July, August, September, and October, but longer minimum periods, up to 10 min. in January and February, were required in other months. Partial protection, however, was afforded by shorter periods of irradiation than these. A diurnal variation in the effectiveness of the Tucson sunlight was also observed, this variation being greater in winter than in summer. In June, July, August, and September exposure periods of 5 min. at 9 a. m., of from 1 to 2.5 min. at 11 a. m. and 1 p. m., of 5 min. at 3 p. m., and of approximately 10 min. at 4:30 p. m. were effective in promoting normal calcification. Shorter exposures than these afforded but partial protection. In December, January, and February 1-hr. irradiation at 9 a. m. and at 4:30 p. m. afforded only partial protection, but 10 min. at 1 p. m. was entirely effective. These seasonal and diurnal variations were apparently related to variations in the altitude of the sun. Indirect sunlight or skyshine, as in the shadow of a building, was effective in the prevention of rickets upon increase in exposure times. Skyshine showed comparatively little seasonal fluctuation, the effective exposure periods being in the range of from 10 to 30 min. daily.

For complete healing of rachitic lesions, from two to three times as much solar irradiation was required as for prevention of rickets under the conditions of these experiments. Partial healing, as judged by the degree of calcification of rachitic metaphyses, occurred, however, with shorter exposure to the sunshine. The significance of these findings in relation to the possible occurrence of rickets in children in Tucson is discussed.

TEXTILES AND CLOTHING

Textile fibres and materials. R. HÜNLICH, trans. by A. J. HALL, edited by H. P. CURTIS (*London: Thomas Skinner & Co., 1939, 1. Brit. ed., pp. [1]+222, figs. 122*).—This book, dealing with the construction of textile fabrics, is written in three sections covering the textile fibers as raw materials, the manufacturing methods as applied to fibers, and the testing and identification of textile fibers. Vegetable fibers, including seed, bast, leaf, and fruit fibers and those produced from plant juices; animals fibers, including wools, hairs, and natural silk; mineral and synthetic fibers; and staple fiber are discussed with regard to origin and production. The second section deals with the production of yarns and fabrics, including knitted and lace fabrics, and with the dyeing and finishing of fabrics. The third section summarizes the methods used for identifying the various fibers, detecting and remedying the damage in textile materials, and laundering processes.

Simplified method for the determination of refractive indices of textile fibres. K. R. FOX and R. B. FINCH (*Textile Res.*, 11 (1940), No. 2, pp. 62-71, figs. 5).—"A new method of determining the refractive indices of fibers is described which uses as its basis a photometric match of Becke line intensities emanating from the difference between the maximum and the minimum refractive indices of the fiber and the index of the mounting fluid." The theory of the method is given, the apparatus and procedure are described, and a mathematical correlation of the data is presented.

New technic developed in measuring the diameter of the cotton fiber. J. H. MOORE. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 183-184).—Methods used (E. S. R., 80, p. 431) to measure diameter of cotton fibers were modified in efforts to make the work less tedious and more accurate. Mercerized mature fibers are now stained in Congo red before drying and diameters as projected on white paper are measured directly with a celluloid metric rule.

Microscopic examination of cotton fibers in cuprammonium hydroxide solutions. C. W. HOCK and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 24 (1940), No. 6, pp. 743-748, pls. 6).—Raw and dewaxed cotton fibers and some further purified by depectinization were studied microscopically upon treatment with cuprammonium hydroxide. The undissolved residue from the raw and dewaxed fibers consisted mainly of transparent shells that had originally formed the outer surface of the fibers and to a lesser extent of material from the lumen. The depectinized cotton fibers dissolved rather completely, leaving only small irregular bits of material having no definite cytological structure. Some observations are presented concerning the appearance of particles, either in the absence or in the presence of cotton fibers, when cuprammonium hydroxide solution is drawn over the slide or the cover glass. The particles are considered to have no bearing on the structure of the cotton fiber and to result from exposure of the cuprammonium hydroxide reagent to the air. The particles did not appear when a specially constructed cell was used which prevented exposure of the reagent.

Microscopic structure of the cotton fiber. C. W. HOCK, R. C. RAMSAY, and M. HARRIS (*Textile Res.*, 11 (1941), No. 4, pp. 200-217, figs. 11).—Cotton fibers that had received various chemical treatments were studied in detail with special respect to apparently new phenomena observed as to their structure. The observations, discussed in detail and illustrated by photomicrographs, led to the conclusion that the cell wall of the cotton fiber consists of a primary and a secondary wall. The latter, comprising the bulk of the fiber, "consists of innumerable spirally oriented cellulose fibrils enclosed by a winding which also makes a spiral, but in the opposite direction from the former. Both the winding and the fibrils reverse their direction at frequent intervals along the axis of the fiber, their points of reversal being coincident. The secondary wall is enclosed by a thin primary wall. The latter is made up of fine crisscrossing strands of cellulose embedded in a membrane consisting principally of wax and pectic materials, plus various amounts of degenerated protoplasm."

Treatment of cotton fibers with cuprammonium hydroxide reagent dissolves the cellulose, leaving residues that vary in amount and structure, depending in part upon the maturity of the fiber and in part upon the purification. Immature fibers containing but little cellulose swell relatively little in the reagent, the undissolved wax and pectic materials maintaining the original tubular shape of the primary wall. Older fibers, however, when given the same treatment swell abruptly, causing the primary wall to break in many places, and give rise to "balloons."

Strength and elongation of silk yarns as affected by humidity, E. M. SOHENKE and H. E. SHEARER (*Jour. Res. Natl. Bur. Standards [U. S.]*, 25 (1940), No. 6, pp. 783-790, figs. 2).—According to the authors' summary, "silk hosiery yarns varying in number of threads from 2 to 9 and in number of turns of twist per inch from 5 to 36 were tested for breaking strength and breaking elongation at 70° F. after various periods of exposure in relative humidities from 33 to 86 percent. The strengths of the yarns were not affected significantly by changes in relative humidity between 33 and 55 percent. The yarns were weaker above 55 percent relative humidity. The elongations of the yarns increased with an increase in relative humidity of the air. The elongation, on the average, increased 1 percent with an increase in relative humidity from 33 to 43 percent, and 1.9 percent with an increase in relative humidity from 76 to 86 percent. The average strength of all yarns was 3.41 gm. per denier when tested under standard conditions. This figure seems to be independent of the size of the yarn, although the strength of a given size varies with the amount of the twist. Some data are given on the breaking strength and elongation of one-thread raw silk."

Protection from degradation which certain finishes provide wool, R. EDGAR (*Iowa Sta. Rpt. 1940, pt. 1, pp. 202-203*).—A progress report on this project (E. S. R., 82, p. 856).

Mildew-resistant treatments on fabrics, M. S. FURRY, H. M. ROBINSON, and H. HUMFELD. (U. S. D. A.). (*Indus. and Engin. Chem.*, 33 (1941), No. 4, pp. 538-545, fig. 1).—This study reports the results of a preliminary survey of the efficacy of finishing treatments considered of possible value as mildew preventives. The finishes, numbering 135, included commercially advertised mildew-resisting agents, other compounds for mildew prevention suggested in the literature, and certain chemical treatments originated by the authors. The treatments were applied to a degreased and desized unbleached cotton duck cut into strips suitable for the raveled-strip breaking-strength test. The mildew resistance of the treated strips was determined by measuring their change in breaking strength after inoculation and incubation with the test organism *Chaetomium globosum*. The microbiological procedure followed was that described by Rogers et al. (E. S. R., 83, p. 428) except that the inoculum was uniformly sprayed on each strip with an atomizer under sterile conditions. Thirty-five of the treatments showed excellent protection against mildew growth. These included miscellaneous organic compounds, several substituted phenols, certain dyes and mordants, certain organometallic compounds and metallic salts of organic acids, several inorganic salts, and a number of the organic compounds developed by the authors and being patented. It is pointed out that many of these treatments, although effecting adequate protection against mildew, were undesirable from the standpoint of color, effect on fabric, or ability to withstand weathering, storage, or laundering. These three latter points are being studied further.

Detergent action of rosin soaps and fatty acid-rosin soaps, W. D. POHLE and C. F. SPEH. (U. S. D. A.). (*Oil & Soap*, 17 (1940), No. 10, pp. 214-216).—Unsize bleached sheeting with a thread count of 75 was cut into 12-in. squares and soiled by dipping in a solution of lubricating oil, tallow, and lampblack (2,000 cc. carbon tetrachloride, 5 gm. lubricating oil, 3 gm. tallow, and from 2 to 4 gm. lampblack). The reflectance relative to MgO was measured with a photoelectric photometer using a mercury lamp and filters for isolating blue light of wavelength 436 mμ. Washing was done in the washing machine in 6 l. of the detergent solution. The reflectance of the cloth after three 10-min. washings, less the reflectance before washing, was taken as an index of

the detergent power of the solution. A gain of 1 percent reflectance is referred to as a one unit of brightness regained. The units of brightness regained by washing in detergent solution, less those regained by washing in distilled water, are the units of brightness regained due to the detergent. The effect of temperature on the detergent action of some of the solutions was determined.

The results indicated that (1) rosin soaps made from different gum rosins, produced from longleaf and slash pine gums, have equal detergent action, (2) the presence of soaps of oxidized rosin acids has no effect on detergent action of the rosin soap, (3) the detergent action of soaps made from pyroabietic acid, abietic acid, and hydrogenated rosin parallels their ability to lower the surface tension of water and the proportion of hydrogen present in the rosin acids, (4) the addition of builders that increase the alkalinity of the rosin soap solution improves the detergent action of the solution, (5) the blending of rosin soap with tallow soap improves the detergent action of the tallow soap in solutions having a soap concentration of 0.25 percent or more, and (6) temperature affects the detergent action of rosin and coconut oil soaps more than that of tallow soap.

HOME MANAGEMENT AND EQUIPMENT

[Consumer economics research by the Iowa Station] (*Iowa Sta. Rpt. 1940, pt. 1, pp. 254-258*).—Included in this progress report are summaries of an extension of the analysis by M. G. Reid and L. G. Albough of farm family incomes and expenditures (*E. S. R.*, 82, p. 858) and of studies by Reid of relative prices of selected commodities in national chain and independent stores in Iowa cities.

Family expenditures for medical care: Five regions. Urban, village, farm, H. HOLLINGSWORTH, D. MONROE, M. C. KLEM, and K. L. BENSON (*U. S. Dept. Agr., Misc. Pub. 402 (1941), pp. VIII+241, figs. 6*).—This report, from the consumer purchases study, is one of the group presenting details of expenditures for major budget categories, other reports having dealt with family income and the pattern of family consumption as a whole (*E. S. R.*, 84, p. 856). This volume gives a description of the medical care expenditures of selected groups of families at different income levels in 20 small cities, 140 villages, and 64 counties of 12 farm sections in the following five regions: New England, Middle Atlantic and North Central, Plains and Mountain, Pacific, and Southeast. These expenditures are analyzed with regard to total medical bills and outlays for the component parts, as for services of physicians, dentists, oculists, nurses, and others; as to medicines and other supplies; and as to health and accident insurance. Differences associated with degrees of urbanization, as indicated by the data presented, are discussed. Consideration is given to relationships between outlays for medical care and family composition (size and age of members) and also family occupation. Tables, discussion of the methodology, and a glossary of terms are given in the appendices.

Family expenditures for automobile and other transportation: Five regions. Urban, village, farm, D. MONROE, D. S. BRADY, J. F. CONSTANTINE, and K. L. BENSON (*U. S. Dept. Agr., Misc. Pub. 415 (1941), pp. III+272, figs. 4*).—This report, like the one noted above, is one of the group presenting details of expenditures for major budget categories of selected urban, village, and farm families in five major regions. Transportation expenditures for these several groups are noted in detail, and in summary the differences between the patterns of transportation expenditures of farm, village, and city families at different income levels are discussed. Tendency to purchase of new or

old cars; purchase price; mileage driven; outlay for gasoline and oil, for tires, tubes, repairs, licenses, taxes, etc., and for accessories and miscellaneous items are considered. Automobile expenditures are also considered as a budget category in relation to budgets for food, housing, household operation, and clothing. It is concluded that "the addition of the automobile is one of the major changes that has taken place in the American standard of living during the past three decades. That families have been willing to restrict outlays for other items to make a place for the car is evidence of the rank it is given in their scale of preference." The basic data are presented in the appendixes, together with statements as to methodology and a glossary of terms.

Installment credit in the sale of washing machines, M. A. ROLLINS ([*New York*] *Cornell Sta. Bul.* 743 (1940), pp. 35, fig. 1).—Washing machines were chosen for this study, since a high proportion of the sales of this commodity are made on installment credit. The information for the study was collected through personal interviews with merchants or credit men in 290 stores selling washing machines in New York State and from a study of 310 contracts selected by the merchants as typical of sales on installment. Analyses of the information from the interviews and the records as to the method of financing the sales, the installment credit terms, the occupation and income of the purchasers, the methods of investigating the customer's credit standing, and the extent of repossession of washing machines are discussed in some detail. Many different methods of expressing the charge for installment credit were in use, due in part to the fact that a number of different agencies financed the contracts, these agencies, as well as the stores, being of different types and in no way united to promote standardization among themselves. On the part of the customer there was no standardization as to amount of the initial payment or the length of time for paying the contracts so that charges varied with the different circumstances. It is thought to be desirable for the customer to give more consideration than is often the case to the method of paying the charge, as well as to the total amount, and for him, as well as the salesman, to be familiar with the schedule.

Operating efficiency of small electric food mixers, L. J. PEET and F. MADDEN (*Iowa Sta. Rpt.* 1940, pt. 1, p. 202).—A progress report on this project (*E. S. R.*, 82, p. 858).

Slip covers for furniture, B. V. MORRISON (*U. S. Dept. Agr., Farmers' Bul.* 1873 (1941), pp. [2]+26, figs. 14).—This publication, superseding Leaflet 76 (*E. S. R.*, 65, p. 696) on slip covers, discusses their uses; their decorative features as expressed in fabric design and in trimming; the choosing of fabrics for their construction, with special regard to service qualities and resistance to shrinkage and fading; the estimation of yardage; and the construction, from the modeling of the slip cover to the cutting, the fitting, the seaming, the making and attaching of the valance, and the construction of the cushion cover.

Household equipment, L. J. PEET and L. E. SATER (*New York: John Wiley & Sons; London: Chapman & Hall*, 1940, 2. ed., pp. XIII+391, figs. [196]).—The second edition of this book (*E. S. R.*, 71, p. 893) has been rather completely revised to bring up to date the information on household appliances, their construction, and their features leading to ease and efficiency of operation. The chapter on home lighting not only considers the new types of lighting, but gives in addition brief descriptions of the testing apparatus.

MISCELLANEOUS

Report on the agricultural experiment stations, 1940, J. T. JARDINE, F. D. FROMME, H. L. KNIGHT, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1940*, pp. 272).—This report is discussed editorially on page 145.

The Mesa Experiment Farm helps farmers help themselves, R. S. HAWKINS and D. C. AEPLI (*Arizona Sta. Bul. 171 (1941)*, pp. [1]+157-186, figs. 50).—A report of the nature and results of work carried on since 1915 at this substation.⁵

Report of the Hawaii Agricultural Experiment Station, 1940, J. H. BEAUMONT ET AL. (*Hawaii Sta. Rpt. 1940*, pp. 94, figs. 29).⁵

Report on agricultural research [of Iowa Station] for the year ending June 30, 1940, I, II, R. E. BUCHANAN ET AL. (*Iowa Sta. Rpt. 1940*, pts. 1, pp. 300, figs. 38; 2, pp. 80, figs. 6).—Part 1 of this report includes reports on all active projects except those relating to work coordinated under the Iowa Corn Research Institute, which is included in part 2.⁵

Fifty-third Annual Report of the University of Maryland Agricultural Experiment Station, [1940], T. B. SYMONS ET AL. (*Maryland Sta. Rpt. 1940*, pp. 75+349, figs. 123).—In addition to the usual report⁵ (pp. 1-75), also issued as a separate edition, this contains reprints of Bulletins 427-434.

Fifty-first Annual Report [of New Mexico Station, 1940], F. GARCIA (*New Mexico Sta. Rpt. 1940*, pp. 82, figs. 9).⁵

Report of Puerto Rico Experiment Station, 1938 [trans. title], [A. LEE] (*Puerto Rico Sta. Rpt. 1938*, Span. ed., pp. II+154, figs. 36).—A Spanish edition of this report (*E. S. R.*, 82, p. 573).

Bimonthly Bulletin, [March 1941], edited by W. C. PALMER (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 4, pp. 35, figs. 11).—In addition to several articles noted elsewhere in this issue and the customary abstracts, this number contains An Investigation of Micro Methods in Comparison With the Standard Method of Determining the Test Weight of Hard Red Spring Wheat, by R. H. HARRIS and L. D. SIBBITT (pp. 23-27); and North Dakota Farm Prices, by W. L. ETTESSVOLD (pp. 30-31).

List of the agricultural periodicals of the United States and Canada published during the century July 1810 to July 1910, S. C. STUNTZ, edited by E. B. HAWKS (*U. S. Dept. Agr., Misc. Pub. 398 (1941)*, pp. VIII+190).

⁵ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—Dr. A. M. Harding became president of the university on July 1. Other appointments include Don Marshall as instructor in rural economics and sociology and Dr. Rebecca Gifford as instructor in veterinary science. The resignations are noted of Dr. C. H. Wadleigh as assistant professor of agronomy and assistant agronomist, Dr. Carter H. Anthony as instructor in veterinary science and assistant veterinarian, and Keith H. Hinchcliff and W. C. Hulburt as instructors in agricultural engineering and assistant agricultural engineers. R. D. Stevens, assistant professor of forestry and assistant forester, has been given a year's leave of absence for Army service.

Colorado College and Station.—Dr. Thomas D. Kroner, assistant professor of veterinary medicine and assistant bacteriologist, has resigned to take a position with a research laboratory in St. Louis, Mo. Livingston P. Ferris, II, assistant in poultry husbandry, has resigned to accept a commercial position in Connecticut. Dr. I. E. Newsom has been appointed dean of the graduate school of the college; A. W. Epp, assistant professor of rural economics and sociology; and V. C. Askew, assistant in animal husbandry.

Connecticut [New Haven] Station.—New greenhouses have been completed which provide one unit each for the departments of entomology, genetics, and plant pathology. A grant has been received from the Rockefeller Foundation in aid of the 5-year program of research in the genetics of plant growth.

Georgia University and Station.—A new barn for the College of Agriculture department of agronomy is under construction, and plans are being completed for a new poultry barn. C. A. Ward, instructor in animal husbandry, has resigned to accept a position with the American Jersey Cattle Club.

Illinois University.—William A. Foster, associated with the work in rural architecture since 1924 and associate professor since 1936, died April 12 at the age of 57 years. He was a native of Ohio and a graduate of Ohio State University. He had also been connected with the Iowa Station from 1917 to 1923 and the Georgia College from 1923 to 1924.

Dr. Alexander Arsene Girault, assistant in entomology from 1909 to 1911 and associated with what is now the U. S. D. A. Bureau of Entomology and Plant Quarantine from 1904 to 1908 and again from 1914 to 1918, died in Brisbane, Queensland, May 2 at the age of 57 years. He was a native of Maryland and a graduate in 1903 of the Virginia Polytechnic Institute. From 1911 to 1914 and since 1917 he resided in Australia, where he served first as entomologist of the Bureau of Sugar Experiment Stations and later as assistant entomologist in the Queensland Department of Agriculture. His principal interest was the description and classification of chalcid flies, of which he described approximately 750 new genera and many more new species.

Kansas College and Station.—For the support of the college and the four branch stations during the current biennium the legislature has appropriated \$2,412,900. In addition to lump sum appropriations for salaries and maintenance of instruction and research the total includes \$120,000 for the four branch stations, \$53,000 for outlying experiment fields, \$10,000 for bindweed experimental

work, \$30,000 for research work on diseases of livestock, \$15,000 for milling and baking research, \$30,000 for laboratory equipment, \$15,000 for the purchase and improvement of horticultural land, \$10,000 for repairs and improvements to the physical plant of the department of animal husbandry, \$50,000 for the construction of a small animal research laboratory, \$8,000 for the purchase of land at the Colby Substation, and \$200,000 for extension work. Other new items include \$30,000 for three home management houses, \$19,500 as indemnity for the fire losses of March 15 (E. S. R., 84, p. 860), and \$30,000 for a W. P. A. project for a military science building to cost \$125,000.

Other legislation affecting the institution included a quarter-mill tax levy which is expected to raise \$600,000 per year for a building program at the five State schools, specific allocations from this fund to be made by future legislatures; an act authorizing the State schools to construct student union buildings and dormitories under a plan for ultimate repayment from fees and operating revenues; and a civil-service law covering certain nonteaching, nonresearch, and nonadministrative positions in the State schools.

Dr. H. C. Fryer of the department of mathematics has been designated statistician of the station and will direct the work of a statistical laboratory for the service of the station staff.

Massachusetts College and Station.—Dr. George E. Stone, head of botanical work from 1893 to 1917, died May 28. Born in Leicester, Mass., on September 6, 1860, Dr. Stone was graduated from the college in 1886, studied for several years at the Massachusetts Institute of Technology, and in 1893 received the Ph. D. degree from the University of Leipzig. His active career was spent entirely at the college, where he rendered a unique service in the training of teachers and investigators and in his own pioneer work in such phases of economic botany as the pathology of shade trees and tree surgery.

Mississippi Station.—Dr. L. E. Miles, plant pathologist since 1928, died May 10, aged 51 years. A native of Indiana and a graduate of Wabash College in 1914, he received the Ph. D. degree from the University of Illinois in 1920 and in the same year became plant pathologist of the Mississippi State Plant Board. From 1922 to 1924 he was associated with plant pathological work in the Alabama College and Station and in 1927–28 with that of the Washington College and Station. Much of his work in Mississippi had dealt with cotton diseases, notably the effect on cotton wilt of potash fertilizers.

Recent appointments include in the department of agronomy W. H. Freeman vice C. R. Owen, resigned to accept a position in the Louisiana University and Station, and Peter G. Hogg.

Pennsylvania College and Station.—Thomas I. Mairs, professor in charge of correspondence courses in agriculture, has retired after nearly 40 years' service and has been succeeded by William R. White, associate professor of agricultural education extension. Dr. Glen W. Hedlund, extension assistant professor of marketing in Cornell University, has been appointed head of the department of agricultural economics, effective September 1.

Office of Experiment Stations.—The 1941 John Deere Medal was awarded by the American Society of Agricultural Engineers at its Knoxville meeting on June 25 to Robert W. Trullinger, Assistant Chief of the Office. This is the fourth award of this medal, which is bestowed for "distinguished achievement in the application of science and art to the soil."

EXPERIMENT STATION RECORD

VOL. 85

September 1941

No. 3

THE FEDERAL OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

"For the purpose of assuring adequate provision for research on scientific and medical problems relating to the national defense," an Executive order signed by President Franklin D. Roosevelt on June 28, 1941, sets up within the Office for Emergency Management of the Executive Office of the President the Office of Scientific Research and Development. This office is headed by a director appointed by the President, and he has selected for this position Dr. Vannevar Bush, director of the Carnegie Institution of Washington.

The duties and responsibilities of this new agency are set forth in the Executive order in considerable detail. Subject to such policies, regulations, and directions as the President may from time to time prescribe and with such advice and assistance as may be necessary from the other departments and agencies of the Federal Government, the office is to "advise the President with regard to the status of scientific and medical research relating to national defense and the measures necessary to assure continued and increasing progress in this field; serve as the center for the mobilization of the scientific personnel and resources of the Nation in order to assure maximum utilization of such personnel and resources in developing and applying the results of scientific research to defense purposes; coordinate, aid, and, where desirable, supplement the experimental and other scientific and medical research activities relating to national defense carried on by the Departments of War and Navy and other departments and agencies of the Federal Government; develop broad and coordinated plans for the conduct of scientific research in the defense program in collaboration with representatives of the War and Navy Departments, review existing scientific research programs formulated by the Departments of War and Navy and other agencies of the Government, and advise them with respect to the relationship of their proposed activities to the total research program; . . . initiate and support such scientific and medical research as may be requested by the government of any country whose defense the President deems vital to the defense of the United States under the terms of the Act of March 11, 1941, entitled 'An Act to Promote the Defense of the

United States,' and serve as the central liaison office for the conduct of such scientific and medical research for such countries; perform such other duties relating to scientific and medical research and development as the President may from time to time assign or delegate to it."

In carrying out its functions, the office is to utilize the laboratories, equipment, and services of governmental agencies and institutions to the extent that such facilities are available for such purposes. Within the limits of funds appropriated or allocated, the director may contract with and transfer funds to existing governmental agencies and institutions and may enter into contracts and agreements with individuals, educational and scientific institutions (including the National Academy of Sciences and the National Research Council), industrial organizations, and other agencies, for studies, experimental investigations, and reports.

Further to carry out the purposes of the order, provision is made for two national committees, an advisory council, and such advisory committees as the director may find necessary. The national committees deal with defense research and medical research, respectively, and each will consist of a chairman and three other members to be appointed by the President. The defense committee will also include the president of the National Academy of Sciences, the Commissioner of Patents, an officer of the Army and the Navy, and "such other members as the President may subsequently appoint." The medical research committee will include three members selected from the staffs of the Surgeons General of the Army, Navy, and Public Health Service with particular reference to their qualifications in medical research. Both committees will advise and assist the director in the mobilization of the personnel of the Nation in their respective fields, and each shall from time to time, on request of the director, make findings and submit recommendations with respect to the adequacy, progress, and results of research on scientific and medical problems related to the national defense. The defense research committee will also become responsible for recommendations as to the need for and character of contracts to be entered into with universities, research institutes, and industrial laboratories for research and development on instrumentalities of warfare to supplement such research and development activities of the Departments of War and the Navy, and the medical research committee for similar recommendations in the field of the medical sciences.

The advisory council consists of the director, the chairmen of the two committees just described, the chairman of the National Advisory Committee for Aeronautics, and one representative each of the Army and Navy. It will "advise and assist the director with respect to the

coordination of research activities carried on by private and governmental research groups and shall facilitate the interchange of information and data between such groups and agencies."

Another branch of the Executive Office of interest in this connection was created on July 30, 1941, under an Executive order establishing the Office of the Coordinator of Inter-American Affairs. This office is to "serve as the center for the coordination of the cultural and commercial relations of the Nation affecting hemisphere defense," and will formulate, recommend, and execute programs which will further the commercial well-being of the Western Hemisphere. The policy is prescribed of collaborating with and utilizing the facilities of existing departments and agencies, and the coordinator may "contract with and transfer funds to existing governmental agencies and institutions and may enter into contracts and agreements with individuals, educational, informational, commercial, scientific, and cultural institutions, associations, agencies, and industrial organizations, firms, and corporations." A committee on inter-American affairs is also set up within the office, consisting of the coordinator as chairman, one designee each from the Departments of State, Treasury, Agriculture, and Commerce, the president of the Export-Import Bank, and such additional representatives from other agencies and departments as may be designated by their heads as requested. This committee is to "consider and correlate proposals with respect to the commercial, cultural, educational, and scientific aspects of hemisphere defense relations, and shall make recommendations to the appropriate Government departments and agencies."

The foregoing summary follows rather closely the text of the two orders and epitomizes their significant provisions. Except as stated, no specific mention is made of agricultural research, the Department of Agriculture, or the land-grant institutions, and the extent to which any or all of these will be directly affected remains to be seen. It will be noted that broad authority for correlation of existing research agencies of the Government is conferred, and the procedures and policies which are worked out will doubtless be awaited with considerable interest.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemical investigations of the tobacco plant.—VIII, The effect upon the composition of the tobacco plant of the form in which nitrogen is supplied, H. B. VICKERY, G. W. PUCHER, A. J. WAKEMAN, and C. S. LEAVENWORTH (*Connecticut [New Haven] Sta. Bul.* 442 (1940), pp. 61-119, figs. 16).—The work here noted is in continuation of researches previously noted (E. S. R., 79, p. 149). Growing tobacco plants in sand with a culture solution containing all known required elements and a total nitrogen supply adequate for normal growth but not in excess, the authors varied the proportions of nitrates and ammonium salts from all nitrate to 90 percent ammonium nitrogen and 10 percent nitrate nitrogen.

At the 20-percent level of ammonium nitrogen, a definite stimulation in size of the plants as compared with the nitrate controls was noted. The 40- and 60-percent ammonia plants were not greatly different in size from the controls, but the 80- and 90-percent plants were smaller. There was a marked diminution in nitrate nitrogen stored in the tissues as the relative proportion of ammonium ion in the culture solution was increased, but there was a relatively much smaller increase in stored ammonia nitrogen. The effects upon the amides of the tissues were very small. Glutamine was not significantly changed, although asparagine was slightly increased. Very little change in the amount of soluble organic nitrogen occurred. The protein content of the tissues increased slightly when calculated in terms of organic solids.

Hydration, as measured either by actual weight of water per plant or by concentration of total solids in unit weight of fresh tissue, increased phenomenally with increase in ammonia. The organic acids, especially malic and citric acids, decreased remarkably both in quantity per plant and in concentration in the tissues, and a profound alteration in the distribution of acidic and basic components was indicated. The soluble carbohydrates likewise diminished in quantity and in concentration, and evidence of a close metabolic relationship between the several forms of carbohydrate was obtained.

Alterations in many aspects of the metabolism were noted, and it is considered that many of these may be provisionally attributed to the fundamental effects on the quantities of organic acids and to concomitant effects on the absorption of inorganic ions. A considerable sensitivity of the mechanisms involved in the balance between positive and negative ions in the cells is suggested. Furthermore, the failure of the high ammonia plants to synthesize carbohydrates as extensively as those furnished with a high proportion of nitrate suggests that the photosynthetic mechanism is affected.

Extraction of protein: Chemical studies, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 1, p. 4).—Proteins were extracted in a condition such as to be suitable for industrial purposes from oil press cakes of cottonseed, peanuts, and soybeans without solvent extraction to remove the remaining oil. This procedure obviated heating to remove the oil solvent to a temperature

between 60° and 70° C., which is said to denature the protein content of the seed to an extent such as to unfit the protein for technical use.

The relative sweetness of sugars as affected by concentration, A. C. DAHLBERG and E. S. PENCZEK (*New York State Sta. Tech. Bul.* 258 (1941), pp. 12, figs. 3).—The relative sweetness of levulose, β -lactose, maltose, dextrose, and corn sirups, as compared with that of sucrose solutions as standards, varied directly with the concentration. The relative sweetness of these sugars, except levulose, was nearly twice as great in high concentration as in low concentrations. The relative sweetness of β -lactose and maltose varied from 33 to 60 percent, dextrose from 62 to 100 percent, high conversion corn sirup from 40 to 80 percent, and ordinary corn sirup from 28 to 54 percent. A significant supplementary effect of dextrose and corn sirups in sucrose solutions was found. This effect was sufficient to give both dextrose and high conversion corn sirups a sweetness the same as that of sucrose in 25 percent solutions. Regular corn sirup was as sweet as sucrose in 40 percent sucrose concentrations.

The relative sweetness of sugars bore a log-log relationship to that of sucrose R being the relative sweetness and S the percentage concentration of sucrose used as the standard for comparison, the relative sweetness of the corn sweeteners was shown to be expressed by the parabolic equation $R=37.097 S^{0.3038}$, and the relative sweetness for all the sugars studied, omitting levulose, was expressed by the equation $R=32.598 S^{0.3300}$. The percentage error in the data due to the limit of accuracy in tasting varied from 2.5 to 4. This represented from 0.07 to 2 percent sucrose, and this variation increased with increased concentration. The least percentage error was secured at 10 and 20 percent sucrose where differences of 0.25 and 0.5 percent, respectively, of sucrose were detected.

The dissimilation of levulose by heterofermentative lactic acid bacteria, M. E. NELSON and C. H. WIERKMAN (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 359-365).—A comparison of the dissimilation of levulose with that of glucose plus hydrogen acceptors by heterofermentative lactic acid bacteria (*Lactobacillus lycopersici* and *Leuconostoc dextranicus*) indicated that the two sugars behave similarly. "This relationship suggests that in the fermentation of levulose the ketose is functioning simply as an acceptor to compete with normally formed intermediary acceptors and that the mechanism of dissimilation of the levulose not acting as an acceptor is quite similar to that of glucose. In both cases, the production of ethyl alcohol and glycerol was reduced by acceptors; acetylmethylcarbinol in the case of glucose to form 2,3-butylene glycol and levulose, acting as its own acceptor, to form mannitol. On the other hand, the yield of acetic acid was increased according to expectations. The path of dissimilation of the oxidized levulose is apparently the same as that of glucose under normal conditions."

The chemical composition of some high iodine number soybean oils, F. G. DOLLEAR, P. KRAUCZUNAS, and K. S. MARKLEY. (U. S. D. A. et al.). (*Oil & Soap*, 17 (1940), No. 6, pp. 120-121).—The authors examined a number of soybean oils of exceptionally high iodine number, obtaining results which indicate that the distribution of the saturated and various unsaturated fatty acids in the soybean seed bears a definite relation to the iodine number of the oil, and that their formation in these proportions is governed by a specific and relatively invariable biochemical process, independent of varietal, climatic, or pedological conditions. They conclude that (1) the ratio of saturated to unsaturated acids in soybean oil is fairly constant, irrespective of the total amount of oil present in the seed or of the iodine number of the extracted oil, and that (2) the distribution of the unsaturated acids varies in a specific manner with the

iodine number of the oil derived from the seed, but is independent of the total amount of acids which are formed during growth and maturation and stored by the seed in the form of various lipides.

The stability of vegetable oils.—I, The spectral transmittance of soybean oils, W. G. BICKFORD, S. ANDERSON, and K. S. MARKLEY. (U. S. D. A. et al.). (*Oil & Soap*, 17 (1940), No. 7, pp. 138-143, figs. 10).—From an examination of 84 samples of soybean oils, the spectral-transmissive curves of 35 of which are presented with this paper, the authors conclude that: (1) The spectral-transmissive properties of soybean oils are influenced by the method used in removing the oil from the bean as well as by subsequent processing procedures, (2) the Lovibond color readings give at best only approximate information concerning the spectral color of an oil, and (3) the carotenoids are removed during refining operations, the greatest loss usually occurring during the deodorizing treatment. Chlorophyll, which is present in various concentrations in the crude oil, is completely absent from the finished oil so far as spectrophotometric evidence is concerned.

Molecular distillation and low temperature crystallization of cottonseed oil and the stability of the molecularly distilled fractions, R. W. RIEMENSCHNEIDER, C. E. SWIFT, and C. E. SANDO. (U. S. D. A.). (*Oil & Soap*, 17 (1940), No. 7, pp. 145-148, figs. 7).—Molecular distillation of 1,400 gm. of the oil showed a small degree of fractionation of the glycerol esters. Unsaponifiable material was largely concentrated into the first fraction. Fractional crystallization from acetone at various temperatures ranging from 0° to -65° C. gave results indicating that crystallization methods may be used to advantage in connection with other physical and chemical methods for the separation of the oil components.

Cocos pulposa palm kernel oil, G. S. JAMIESON and W. G. ROSE. (U. S. D. A.). (*Oil & Soap*, 17 (1940), No. 7, p. 144).—Kernels from the palm *C. pulposa* from Uruguay contained 59.5 percent of oil and 4.8 percent of moisture. The expressed oil had the following characteristics: Saponification value 260.3, iodine number (Hanus) 24.6, thiocyanogen value 22.4, Reichert-Meissl value 71, and Polenske value 24.8. It contained 0.44 percent of unsaponifiable matter and the following percentages of acids: Caproic 1.47, caprylic 9.4, capric 13.2, lauric 34.4, myristic 6.6, palmitic 1.8, and stearic 1.3. The oil is suited for making soap and, after refining, as an ingredient in margarine manufacture.

Fenugreek seed oil, H. A. SCHUETTE, M. A. COWLEY, H. A. VOGEL, and M. M. MUELLER. (Univ. Wis.). (*Oil & Soap*, 17 (1940), No. 6, p. 122).—The authors obtained values for a number of analytical constants not markedly different from those previously given and added determinations of the Polenske number, hydroxyl number, acid number, soluble acids, saturated acids, and unsaturated acids (content, iodine number, and thiocyanogen number). They found the oil to yield palmitic acid 7.3 percent, stearic acid 2.4, arachidic acid 0.9, behenic acid 0.6, oleic acid 21, linoleic acid 37, and linolenic acid 19 percent.

The thiocyanogen value of linolenic acid, J. P. KASS, H. G. LOER, F. A. NORRIS, and G. O. BURR. (Univ. Minn.). (*Oil & Soap*, 17 (1940), No. 6, pp. 118-119).—Ethyl linolenate (Wijs iodine number 247.3; theory 248.5) was prepared by the debromination of purified hexabromostearic acid. The thiocyanogen value was found to be 151.2, corresponding to a corrected value of 167.3 for the free linolenic acid, rather than the theoretical value of 182.5. Data presented show the effects of time, excess, and concentration of reagent. The thiocyanogen number of linolenic acid is shown to be an empirical value. It is, however, reproducible under carefully controlled conditions. Certain improvements of technic were found to insure reproducibility of results.

A note on the preparation of alkyl linolenates, F. A. NORRIS, J. P. KASS, and G. O. BURR. (Univ. Minn.). (*Oil & Soap*, 17 (1940), No. 6, p. 123).—The authors found the substitution of 7.5 N sulfuric acid in absolute alcohol for the same concentration of hydrochloric acid in absolute alcohol to be satisfactory for the debromination of tetrabromostearic acid, which reacts vigorously with zinc dust in absolute alcohol even in the absence of mineral acids, but that the sulfuric acid is ineffective in the debromination and esterification of the hexabromostearic acid, the reaction being slow and incomplete. When equal weights of finely divided zinc dust and finely powdered hexabromide suspended in 2.5 parts of boiling alcohol are treated dropwise and under reflux with 2.5 parts of approximately 7.5 N alcoholic HCl, the reaction mixture becomes clear within 10 min after the addition of the acid is begun. The rapid debromination and subsequent ease of extraction of a colorless ester with a practically theoretical iodine number "amply compensate for the inconvenience of preparing the anhydrous alcoholic HCl."

Surface tension of rosin soap solutions, W. D. POHLE. (U. S. D. A.). (*Oil & Soap*, 17 (1940), No. 7, pp. 150, 151).—The surface tension of soap solutions made from rosins and rosin acids was measured, and the surface tensions of fatty acid soap solutions and fatty acid-resin soap solutions were measured and compared. Concerning soap solutions made with the principal fatty acids found in the toilet, household, and laundry soaps and soap solutions made with fatty acids and rosin mixed in the ratio of 3:1 by weight, it was found that, with the exception of lauric and caprylic acid soap, the presence of rosin soap has little or no effect on the surface tension of the soap solutions. The replacement of a portion of the caprylic acid soap by rosin soap yields a solution with a lower surface tension. The same is true of the 0.1 percent lauric acid soap solution.

Acetic and lactic acids, F. W. FARIAN (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 9, pp. 263-270, 281).—This is a more or less popular discussion (1) of the production of acetic and lactic acids, (2) of the occurrence and uses of these acids in foods, and (3) of their physiological effects. Reference to numerous physiological experiments indicates that acetic, lactic, and citric acids are quite harmless when used in moderate quantities.

Properties of the oxidizing enzymes of certain vinifera grapes, A. A. HUSSEIN and W. V. CREWS. (Univ. Calif.). (*Food Res.*, 5 (1940), No. 6, pp. 637-648, fig. 1).—Methods for obtaining satisfactory preparations of the oxidizing enzymes of white grapes, and for estimating the activity of such preparations, are reported upon, together with the distribution of the enzyme and its action upon several substrates.

The enzyme concentration was higher in the fibrovascular bundles and epidermis than in the pericarp. Substrates acted upon positively by the enzyme preparation included pyrogallol in the presence of H_2O_2 . Tyrosine was not attacked. The natural substrate of the grapes was purified, and when added to the enzyme preparation reacted even in the absence of H_2O_2 . At low to medium concentrations of the enzyme the color produced in unit time varied approximately directly with the enzyme content of the solution. The optimum pH range under the conditions described, guaiacol being the substrate, was about pH 4.5 to 5.5. H_2O_2 concentration markedly affected the enzyme activity. Over 90 percent of the activity of the enzyme was destroyed by 5×10^{-3} molar KCN, and 100 percent destruction occurred at 4×10^{-4} molar concentration. These observations and other properties of the enzyme led the authors to consider it a peroxidase. No reduction of methylene blue was secured with various substrates. The preparation appeared to contain little or no dehydrog-

enase. In the absence of catechol and its derivatives ascorbic acid was not oxidized, but in the presence of catechol the acid was rapidly oxidized although no color of orthoquinone appeared until all of the ascorbic acid had disappeared.

Fluoride ion strongly inhibited the enzyme. At 60 percent by volume of ethyl alcohol the enzyme appeared to be completely inhibited, but activity was well retained at from 10 to 20 percent alcohol. Sucrose caused an increase in the enzyme activity between 10 and 50 percent sucrose, with greatest activity between 20 and 30 percent. Activity was decreased at from 60 to 80 percent, but even in saturated sucrose solution it was still appreciable. SO_2 reduced the enzyme activity, progressively with increased concentration, but even at 5,580 p. p. m. of SO_2 the enzyme was not completely destroyed. Papain and trypsin at their optimum pH values, 5 and 7, respectively, destroyed the enzyme.

The optimum temperature range appeared to be in the neighborhood of from 33° to 40° C. (91.4° to 104° F.).

A micro-respirometer for the study of the aerobic metabolism of micro-organisms, H. G. WOOD, C. R. BREWER, M. N. MICKELSON, and C. H. WERKMAN. (Iowa Expt. Sta.). (*Enzymologia*, 8 (1940), No. 5, pp. 314-317, fig. 1).—It is pointed out that a satisfactory instrument must permit of determining at selected intervals the oxygen consumed and the gases produced, such as carbon dioxide and hydrogen; make provision for obtaining samples as desired for determination of nongaseous products; have an adjustable rate of aeration; supply facilities for varying the composition of the gas above the medium, to permit anaerobic experiments, as well as those under various oxygen tensions, or with gases other than air or oxygen; must be independent of small changes in atmospheric pressure or temperature; and must be adaptable to changes of design to meet the requirements of experiments under varied conditions.

A closed system macrorespirometer of the constant pressure type is described. A diagrammatic drawing shows the arrangement and mode of operation of the assembly. It provides for a 500-cc. dissimilation and the estimation of carbon dioxide by absorption in alkali, and hydrogen by burning to water with hot copper oxide. Air (or other gas) is circulated through a sintered glass disk in the medium. Oxygen uptake is determined manometrically by change in volume of gas. Samples of the medium may be removed aseptically for determination of the nongaseous products. Complete determination of the products may be made at any time. Satisfactory carbon and oxidation-reduction balances have been obtained with both aerobic and anaerobic bacterial dissimilations.

The aerobic dissimilation of citric acid by coliform bacteria, C. R. BREWER and C. H. WERKMAN. (Iowa Expt. Sta.). (*Enzymologia*, 8 (1940), No. 5, pp. 318-326, figs. 2).—Employing, in part, the macrorespirometer noted above, the authors carried out experiments leading to the following conclusions:

The oxidation of citric acid by coli-aerogenes bacteria follows the normal anaerobic dissimilation of citrate, which may take place in a strongly aerated medium. Hydrogen gas is produced by *Aerobacter indologenes* during the oxidation of citrate and of succinate or acetate. *Citrobacter* does not form hydrogen aerobically but does oxidize citric acid more rapidly and completely than does *Aerobacter*.

The assimilation of carbohydrate-like compounds during citrate oxidation by coli-aerogenes bacteria is inhibited by appropriate concentrations of sodium azide. Arsenite and moniodoacetate totally inhibit aerobic citrate dissimilation but fluoride and pyrophosphate have only a slight effect. The respiration is partially inhibited by cyanide. *A. indologenes* oxidizes, under aerobic conditions, citric, oxaloacetic, l-malic, fumaric, and pyruvic acids. In addition, formic,

acetic, and succinic acids, which normally accumulate as final products in the anaerobic dissimilation of citric acid, are oxidized aerobically. Aconitic acid is oxidized after an induction period, presumably through citric acid after hydration. *A. indologenes* does not oxidize tricarballic and itaconic acids. Citraconic and α -OH-isobutyric acids are slowly oxidized after an induction period or several hours.

Nutritive requirements of the heterofermentative lactic acid bacteria, H. G. WOOD, C. GEIGER, and C. H. WERKMAN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 367-378, figs. 2).—Riboflavin or thiamin, and factors occurring in ether extract of yeast extract were found necessary for maximal growth of three cultures of heterofermentative lactic acid bacteria in an amino acid medium. The 12 amino acids alanine, valine, glutamic acid, aspartic acid, cystine, methionine, serine, threonine, phenylalanine, tyrosine, arginine, and lysine were also shown to be essential. Omission of any one of them from the medium retarded growth and acid production. Either leucine or isoleucine had also to be added, and the two apparently are interchangeable. Tryptophan was essential for one culture, but the other two cultures did not require it.

Further purification of the growth hormone of the anterior pituitary, H. L. FRAENKEL-CONRAT, D. L. MEAMER, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 27 (1940), No. 4, pp. 605-613, fig. 1).—The authors report upon a modified alkaline extraction method for preparation of growth hormone from beef anterior pituitaries. Cysteine treatment of this preparation led to a purification resulting in an increase in growth-promoting activity, together with a marked decrease of thyrotropic, lactogenic, and gonadotropic hormone contamination. The results indicate that the growth-promoting effects of pituitary extracts cannot be attributed to any one of the above mentioned "target organ" hormones or to a synergistic action between any of these.

Bioassay of water-soluble antihemorrhagic compounds by intravenous administration, D. RICHERT, S. A. THAYER, R. W. MCKEE, S. B. BINKLEY, and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 601-604).—Supplementing previous reports (E. S. R., 83, p. 16), this paper presents the results of bio-assay of a number of water-soluble antihemorrhagic compounds administered by intravenous injection. In the assay method outlined an 18-hr. period was employed; the deficiency of each different lot of chicks was standardized by an accompanying assay of a standard substance, usually 2-methyl-1,4-naphthoquinone; and the potencies were evaluated from responses as to mean prothrombin time, mean clotting time, and percentage of positive response. 1,4-dihydroxy-2-methylnaphthalene monosuccinate, 4-amino-2-methyl-1-naphthol, and 4-amino-3-methyl-1-naphthol, administered intravenously, were slightly less active than 2-methyl-1,4-naphthoquinone, on a weight basis, but fully as active as this compound on a molar basis. The potency of the disulfate on a weight basis was somewhat less than $\frac{1}{6}$ and on a molar basis approximately $\frac{1}{2}$ that of the 2-methyl-1,4-naphthoquinone.

A rat assay method for the determination of riboflavin, J. R. WAGNER, A. E. AXELROD, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 136 (1940), No. 2, pp. 357-364, fig. 1).—In the riboflavin-deficient ration for rats developed by the authors and used with success in the determination of riboflavin in a wide variety of natural products, thiamin, vitamin B₆, and nicotinic acid are supplied in the pure form in amounts of 200 γ , 200 γ , and 2,500 γ per 100 gm. of the diet, and the other B vitamins except riboflavin as a riboflavin-free liver extract, the preparation of which from liver powder or liver fraction B (the Wilson Laboratories) is described in detail. The other constituents of the ration are dextrin 65, casein (Labco) 18, salts I 4, white

corn 6, butterfat 3, cod-liver oil 2, and corn oil 2 parts. The riboflavin-free extract is used in quantities equivalent to 4 percent of the starting material (100 gm.). Rats weighing from 40 to 50 gm. are fed the basal ration ad libitum until depleted of riboflavin, as shown by a weight plateau, this requiring from 3 to 5 weeks. It is emphasized that for a reliable assay it is necessary to establish a calibration curve with pure riboflavin at the same time that the material is being tested. The riboflavin is fed at levels of 3 γ , 6 γ , 9 γ , 15 γ , and 30 γ daily, with from 6 to 9 rats at each level, and the material to be tested usually at three levels with 3 rats at each level.

Riboflavin values obtained by the method described and by the microbiological assay method of Snell and Strong (E. S. R., 82, p. 587) are reported for a number of materials and show good agreement.

Determining riboflavin in dried milk products, [I], R. A. SULLIVAN and L. C. NORRIS. (Cornell Univ.) (*Indus. and Engin. Chem., Analyt. Ed.*, 11 (1939), No. 10, pp. 535-540, figs. 7).—The photometric method described utilizes a zero-potential circuit in connection with a blocking-layer photocell. The operation and calibration of the instrument is fully explained. Extracts of dried milk products obtained by refluxing with a dilute solution of acid in 75 percent acetone, neutralizing, and filtering proved most satisfactory for quantitative measurements. When samples have been caramelized or when other feeding stuffs are present in the sample, further purification of the extracts is necessary.

Rapid microdetermination of boron by means of quinalizarin and a photoelectric colorimeter, L. C. OLSON and E. E. DETURK. (Ill. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 4, pp. 257-264, fig. 1).—The method described depends upon the formation of a violet color, changing, in the presence of very small quantities of boron, to blue shades, when 1,2,5,8-tetrahydroxyanthraquinone is dissolved in sulfuric acid of a strength such that the final concentration lies between 92 and 94 percent by weight after the addition of the solution containing the boron. To obtain this concentration in the final mixture, 98.5 percent sulfuric acid is used, 9 cc. being added to 1 cc. of the sample solution or of the standard. Color intensity is determined by means of a photoelectric colorimeter. An "orange" filter (type and spectral absorptions not specified) is used. With ordinary concentrated sulfuric acid it is not possible to detect less than 0.002 mg. of boric acid in 1 cc., but with using the more concentrated acid the sensitivity is so far increased as to permit detection of 0.002 mg.

Determination of nicotine in fresh tobacco leaf, L. N. MARKWOOD. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 4, pp. 804-810).—A short method is described for determining the nicotine content of fresh tobacco which consists essentially in digesting a small area of the leaf with sulfuric acid, treating the resulting solution with litharge to remove protein, neutralizing, treating with magnesium for removal of lead, and measuring the nicotine either turbidimetrically as phosphotungstate or colorimetrically with cyanogen bromide and β -naphthylamine. The method gave true results where nicotine was the only alkaloid, but low-nicotine Maryland tobacco was found to contain about 95 percent of the total alkaloids as nornicotine, and in this case abnormally high results were obtained.

Turbidimetric determination of nicotine as phosphotungstate, L. N. MARKWOOD. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 4, pp. 800-804, fig. 1).—The author describes a turbidimetric method for determining nicotine in concentrations from 1 to 6 μ g. per cubic centimeter, the turbidity produced by phosphotungstic acid, which is added to the nicotine solution containing a fixed quantity of sulfuric acid, being measured photometrically. The time required was found to be only a few minutes.

Quantitative characteristics of the nicotine color reaction with cyanogen bromide and β -naphthylamine, L. N. MARKWOOD. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 4, pp. 792-800).—The color reaction studied showed maximum sensitivity at about pH 10, and the phenolphthalein end point was found to approach this point closely enough in practice. In neutralizing alkaline solutions greater sensitivity was attained by using acetic acid than with hydrochloric acid and this in turn was greater than with sulfuric acid. With from 0.25 to 0.8 gm. of sodium acetate present the best development of the color appeared in 45 min. The period increased to 150 min. at lower concentrations of the salt. The maximum sensitivity conditions were a sodium acetate concentration of 0.2 gm. per 100 cc. and a development time of 1 hr. The Beer transmission law was found to hold up to a nicotine concentration of at least 80 μ g. per cubic centimeter.

The reasons for quality control of quick frozen foods, D. K. TRESSLER (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 3, pp. 76-77, 87, 89).—This is a discussion of commercial process management, emphasizing the necessity for research laboratory work including semicommercial packs before large-scale production is attempted.

Report on frozen pack experiments, W. V. CRUESS and N. WEST. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 2, p. 43).—Experiments on freezing storage of ripe olives led to the tentative general conclusions that Sevillanos are unsuited to frozen pack, Missions are better than Manzanillos for frozen pack, and quick freezing gives a product superior to the slow frozen, but even the quick-frozen Missions are inferior to the regularly canned Missions (240° F. for 60 min.) in texture. They are, if of good flavor in the vat, superior to the regularly canned in flavor.

Classification of pickles, F. W. FARLAN and R. G. SWITZER. (Mich. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 5, pp. 136-140).—The authors list and describe specifically, under the three main heads of dill, sour, and sweet pickles, the more common products of this type. The purpose of the article is to furnish a guide to manufacturers for labeling to eliminate confusion in this class of food products.

Role of certain salts in color control in olive pickling, W. V. CRUESS, N. WEST, and D. BEAVERS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 6, pp. 175, 185).—Treatment in salt brine between lye treatments was found preferable to addition of salt to the lye solutions. Treatment in 0.5 percent calcium chloride after the second lye treatment hardened the olives but greatly retarded subsequent lye penetration, and after the last lye it fixed the color and hardened the olives but caused a persistent bitter, brackish taste. It is considered that a 0.1 percent calcium chloride solution is of ample strength. Applied at the beginning of washing, this concentration of calcium chloride caused less bitter taste, but the authors prefer other methods. Calcium chloride in low concentration, applied early in the washing procedure, and thoroughly leached out before canning, may be used, however, to fix color and give firmness "without materially affecting the flavor."

Blanching of walnuts, W. V. CRUESS and J. D. PONTING. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 10, p. 292).—Neither hot water nor steam blanching of walnuts loosened the skins sufficiently to permit their removal, but boiling lye solutions made possible the removal of the skins by spray or by vigorous agitation in water. Immersion in, or spraying with, dilute hydrochloric acid after the lye blanching counteracted the tendency to darken during drying.

The peeled nuts after draining were in some cases dropped in hot oil, cooked, drained, and salted with very good results. In others they were dehydrated to low moisture content.

Canning soft-ripe freestone peaches, H. H. MOTTERN and A. M. NEUBERT. (U. S. D. A. and Wash. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 10, pp. 293-296, figs. 4).—Some improvements in the details of the commercial processes are briefly discussed.

Canned dessert apples, A. A. MCCORNACK, C. R. FELLERS, and W. A. MACLINN. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 1, pp. 5-6, 25, fig. 1).—The main factor making apples difficult to can is the quantity of air in their porous tissues, since the oxygen reacts with the metal of the can in the presence of the fruit acid to cause "pinholing" and hydrogen gas pressure. To can apples successfully most of the oxygen, if not the other gases, must be expelled before the can is sealed. Soaking apples in a 2 percent brine solution will expel the air by respiration, and soaking in brine or in a 5 percent sucrose solution prevents the apple slices from turning brown. Cold water also retards the oxidation process. Prolonged brine soaking reduces the tendency of the apples to become excessively soft in subsequent steaming but may cause a loss of flavor and result in a rather insipid and salty tasting pack. Moreover, salt in canned apples tends to increase pinholing.

By substituting 0.5 percent hydrochloric acid for the 2 percent brine, an objectionable flavor produced by the brine treatment was eliminated. Deaeration was best secured by treatment under a 24- to 28-in. vacuum in 10 percent sirup, followed by canning and processing in from 40 to 45 percent sucrose sirup or in a sirup in which 2.5 percent of honey or 20 percent of dextrose replaced the corresponding part of the sucrose and thereby improved the flavor of the product. The Northern Spy, Stark, Northwest Greening, and Arkansas varieties were among those successfully canned.

Sauce preparation from Pacific Northwest apples, A. M. NEUBERT and H. H. MOTTERN. (Wash. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 3, pp. 68-71, 89, 92).—Methods in commercial use in eastern canneries are discussed, some experiments with apple varieties of the Pacific Northwest are briefly reported upon, and the conclusion is reached that a Pacific Northwest applesauce industry supplying the west coast, Alaska, etc., is probably economically practicable.

Canning apple juice in the Pacific Northwest, H. H. MOTTERN, A. M. NEUBERT, and C. W. EDDY. (U. S. D. A. and Wash. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 2, pp. 36-38, 55, 57, fig. 1).—The authors found pectin hydrolizing enzymes the most practical clarification method. Further precipitation occurring from 1 to 6 weeks after clarification was found not due to further enzyme action, and juices to which from 0.1 to 1 percent of apple pectin had been added after pectinase clarification yielded no precipitate, apparently because of the stabilizing action. The tendency to develop off-flavors during pasteurization is considered to require short-time, high-temperature pasteurization. The specially enameled tin originally developed for wines was the only tin sufficiently resistant to corrosion.

Effect of heating on the clearing of citrus juices, M. A. JOSLYN and A. SEDKY. (Univ. Calif.). (*Food Res.*, 5 (1940), No. 3, pp. 223-232, figs. 3).—The effect of pH, temperature, and time of heating on the inactivation of enzymes responsible for the clearing of citrus juices was investigated, the orange and lemon juices being heated each at its natural pH value and after adjustment to approximately the natural pH of the other, for which adjustment citric acid was added to the orange juices and sodium hydroxide to the lemon juices. Each

type of juice was heated, therefore, at about pH 4 to 4.2 and at about pH 2.2 to 2.5. It was found that clearing of juices occurred at lower rates the higher the temperature or the longer the time of heating, that the enzymes in oranges and grapefruit were somewhat more heat resistant than those in lemons, that the enzymes in Valencia oranges were more heat resistant than those in navel oranges, and that the heat inactivation was more rapid at the lower of the two pH values studied.

Blended juices and syrups, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1941), No. 6, pp. 164-165, 187-188, fig. 1).—Mixtures of juices and sirups or concentrates from several varieties of fruit are discussed from the viewpoint of commercial preparation and marketing. Proportions and preparation methods are suggested.

The fermentation of ameliorated musts, H. E. GORESLINE, E. A. BEAVENS, and A. L. CURL. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 1, pp. 10-12, fig. 1).—The results of fermentation of Catawba, Elvira, Niagara, and Ives musts ameliorated with sucrose and dextrose show that under the conditions of the experiments the utilization of the sugar was more rapid in the dextrose lots. Despite the fact that residual sugar was found in greater quantity in nearly all cases where sucrose had been added, it was determined that in each case all sugar present in the final samples was there as reducing sugars. In commercial practice wine in large containers will ferment dry faster and more completely than in small containers, and the residual sugars found here may, therefore, be higher than under optimum conditions. Although significant differences were shown in the rapidity of utilization of the sugar and in certain of the residual sugar contents, these differences do not seem great enough to suggest the desirability of one type of sugar over the other in such types of fermentation. The addition of diammonium phosphate improved the utilization of the sucrose. The addition of brown sugar did not stimulate the fermentation. The volatile acid content of the dextrose lots of all wines was slightly lower than that of the sucrose lots. No differences in flavor, aroma, or body could be detected in the final lots of wine made with sucrose and with dextrose.

A note on the enzymic darkening of wine, A. A. HUSSEIN and W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 9, p. 271).—The authors briefly report experiments which indicate that white wines will darken by simple auto-oxidation, and that while enzyme action may increase the rate somewhat, it is not essential to the darkening process. These observations confirm those of wine makers that pasteurized white wines, presumably free of oxidase because heated to the inactivation temperature, darken in storage.

Notes on cognac brandy, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 10, pp. 300-302, fig. 1).—The author discusses observations concerning the soil, gathering and pressing of the grapes, and manufacture as found in the Cognac district, north of Bordeaux, France.

AGRICULTURAL METEOROLOGY

The character of weather, A. K. BORTS (*Sci. Mo.*, 52 (1941), No. 6, pp. 534-538, fig. 1).—A semipopular account of the rise of the science of meteorology and of the concepts of "isobars," "cyclones," "anticyclones," and "air-mass" analyses and their relations to the weather which we experience.

The effect of aspect of slope on climatic factors, J. M. AIRMAN. (Iowa Expt. Sta. and U. S. D. A.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 2, pp.

161-167, *figs. 3*).—Quantitative differences induced by variations in aspect of slope in an Iowa location are presented for climatic factors on the basis of their effect on plant growth. North and south slopes were somewhat better protected by woody vegetation than the others. Under the conditions, there seemed to be the greatest contrast in all factors between east and west slopes. The latter had the highest average air and soil temperatures, highest maximum soil temperature at 2 in., longest frost-free season, highest evaporation, greatest wind velocity, and, next to the north slope, the smallest number of alternate freezing and thawing periods. The west slope was the most xeric, with the other slopes ranking in the order, south, east, and north. On the basis of decreasing heat injury the slopes ranked in the order, west, south, east, and north, and on that of cold injury in the order, east, south, north, and west.

The response of trees to climate, W. S. GLOCK (6. *Pacific Sci. Cong., Calif., 1939, Proc., vol. 3, pp. 617-619*).

Precipitation records in California tree rings, E. SCHEULMAN (6. *Pacific Sci. Cong., Calif., 1939, Proc., vol. 3, pp. 707-717, figs. 6*).

Agricultural meteorology: Monthly sequence of summer precipitation at Winnipeg, Swift Current, and Edmonton, J. W. HOPKINS (*Canad. Jour. Res., 19 (1941), No. 4, Sect. C, pp. 85-94, figs. 5*).—This analysis of the monthly sequence of rainfall during the period April-September for 48 yr. (1890-1937) showed no consistent increase or decrease for any of the three Canadian stations.

Kansas snowfall, R. J. YOUNKIN and R. L. FOX. (U. S. D. A.). (*Kans. Acad. Sci. Trans., 43 (1940), pp. 321-324, fig. 1*).—The data here summarized are from climatological records of the State for the 50 snowfall seasons from 1888-89 to 1937-38.

Committee on evaporation and transpiration, 1939-40, J. KITTREDGE. (Univ. Calif.). (*Amer. Geophys. Union Trans., 21 (1940), pt. 2, pp. 406-409*).—A brief report.

Section of hydrology: Reports and papers (*Amer. Geophys. Union Trans., 21 (1940), pt. 2, pp. 365-692, 750-779, figs. 86*).—The following papers are of interest to agricultural meteorology: Report on Exploratory Study of Rain-Gage Shields and Enclosures at Coshocton, Ohio, by H. S. Riesbol (pp. 474-482) (U. S. D. A.); Further Experience With Shielded Precipitation-Gages on Blue Hill and Mount Washington, by C. F. Brooks (pp. 482-485); On the Statistical Analysis of Rainfall-Data, by H. C. S. Thom (pp. 490-499) (U. S. D. A.); The Effect of Contour-Cultivation on Runoff, by H. C. Knoblauch and J. L. Haynes (pp. 499-504) (U. S. D. A. and N. J. Expt. Stas.); Report on Deficiencies in Hydrologic Research, by T. Saville (pp. 504-505); The Influence of a Lodgepole-Pine Forest on Storage and Melting of Snow, by H. G. Wilm and M. H. Collet (pp. 505-508) (U. S. D. A.); A Year of Evaporation From a Natural Land-Surface, by C. W. Thornthwaite and B. Holzman (pp. 510-511) (U. S. D. A.); Derivation of Infiltration-Capacity (f) From Average Loss-Rates (fav.), by L. K. Sherman (pp. 541-550); Sprinkled-Plat Runoff- and Infiltration-Experiments on Arizona Desert-Soils, by E. L. Beutner, R. R. Gaebe, and R. E. Horton (pp. 550-558) (U. S. D. A.); A Graphical Method of Analysis of Sprinkled-Plat Hydrographs, by A. L. Sharp and H. N. Holtan (pp. 558-570) (U. S. D. A.); Ground-Water Recharge in Areas of Deep Water-Table in the Great Plains, by R. G. Cady (pp. 570-574); Artificial Drainage of Land—Stream-Line Experiments, the Artesian Basin, II, by D. Kirkham (pp. 587-593) (Utah State Agr. Col.); The Theory of Ground-Water Motion, by M. K. Hubbert (p. 648); Present Status of Our Knowledge Regarding the Hydraulics of Ground-Water, by O. E. Meinzer and L. K. Wenzel (pp. 648-649); and The Distribution of the Average Depth of Snow on Ground in New York and New

England (II)—Curves of Average Depth and Variability, by R. G. Stone (pp. 672-692). Two lists of current publications on snow and ice, by C. Elges (pp. 750-756) (Nev. Sta.), and B. P. Weinberg (pp. 757-779), respectively, are appended.

The chinook wind east of the Canadian Rockies, H. L. OSMOND (*Canad. Jour. Res.* 19 (1941), No. 4, Sect. A, pp. 57-66, figs. 3).—Studying the chinook wind of the Rocky Mountain region, a number of salient features were established, the most important of which was that of the pressure distribution associated. This involves the establishment of a pressure trough between two anticyclones, one on each side of the Rocky Mountain ridge. The location of this trough relative to the ridge is extremely important. For a strong chinook to occur, the trough must lie in the lee of the Rockies. It was also shown that the region of the chinook is in southern Alberta, extending a short distance east of the mountains.

Monthly Weather Review [September-December 1940] (*U. S. Mo. Weather Rev.*, 68 (1940), Nos. 9, pp. 241-270, pls. 12, figs. 3; 10, pp. 271-299, pls. 12, figs. 17; 11, pp. 301-338, pls. 13, figs. 13; 12, pp. 339-374, pls. 14, fig. 1).—In addition to the usual detailed summaries of meteorological and climatological data, including observations on aerology, weather on the Atlantic and Pacific Oceans, and rivers and floods; solar radiation and sunspot data; and other information, these numbers contain the following contributions:

No. 9.—Highest and Lowest Sea-Level Pressures Observed in the United States, by E. H. Bowie (pp. 241-242); Relation Between Equivalent Potential Temperature and Wet-Bulb Potential Temperature, by H. H. Bindon (pp. 243-245); and Tropical Disturbances of September 1940, by J. H. Gallenne (pp. 245-247).

No. 10.—On the Practical Determination of Height From Upper-Air Data, by P. M. A. Burke (pp. 271-272); An Evaluation of the Bergeron-Findeisen Precipitation Theory, by A. R. Stickley (pp. 272-280); and Tropical Disturbances of October 1940, by J. H. Gallenne (p. 280).

No. 11.—Average Daily Air Mass, by R. E. Kennedy (pp. 301-303); Aerology in the Hurricane Warning Service, by G. E. Dunn (pp. 303-315); and A Dew-Point Recorder for Measuring Atmospheric Moisture, by C. W. Thornthwaite and J. C. Owen (pp. 315-318).

No. 12.—The Variability of the Thermoelectric Pyrheliometer Factor, by I. F. Hand (pp. 339-344); Adjustment of Airport Station-Pressure Records to Former City Station Elevation, by W. W. Reed (pp. 344-347); and North Atlantic Tropical Cyclones of 1940, by J. H. Gallenne (pp. 347-348).

SOILS—FERTILIZERS

[Soil Survey Reports, 1935, 1936, 1937, and 1938 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1935, Nos. 16, pp. 96, pls. 4, figs. 4, map 1; 17, pp. 44, figs. 2, map 1; 1936, Nos. 4, pp. 49, figs. 3, map 1; 5, pp. 55, figs. 2, map 1; 6, pp. 51, figs. 3, map 1; 1937, Nos. 1, pp. 44, figs. 2, map 1; 2, pp. 51, pls. 3, figs. 2, map 1; 1938, No. 1, pp. 55, pls. 2, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1935, Nos. 16, the Visalia area, Calif., R. E. Storie et al., and 17, Washita County, Okla., A. W. Goke et al.; 1936, Nos. 4, Pontotoc County, Okla., E. G. Fitzpatrick et al., 5, Cass County, Nebr., T. E. Beesley et al. (Univ. Nebr.), and 6, Jackson County, Iowa, G. A. Swenson et al.; 1937, Nos. 1, Isle of Wight County, Va., E. Shulkeim et al., and 2, Hall County, Ga., J. T. Miller et al. (Univ. Ga.); and 1938, No. 1, Yuma Desert area, Ariz., W. G. Harper et al.

A method for taking and mounting monolithic soil profile samples, G. M. McCLELLAN and C. D. CONVERSE. (Ohio State Univ.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 120-121).—The authors describe in full manipulative detail a method consisting essentially in forcing a sheet metal box 2.5 in. deep, 4 in. wide, and of the length of the desired depth of profile into the profile face and inverting the monolith thus isolated into a wooden case having a glass front to be slid into place over the finished mount. After placement of the monoliths in the display cases, large cracks and gaps left by shrinkage were filled with glue. When dry the soil was sprayed with a thin lacquer consisting of 2 parts of thinner and 1 of the lacquer. (See also a note by Lyford (*E. S. R.*, 84, p. 587)).

Soil color: Its determination, nomenclature, and significance as a field man's problem, T. D. RICE. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 235-236).—A general discussion of the significance, origin, and classification of soil colors. The need for standardization of soil colors is brought out.

The use of sodium metaphosphate for dispersion of soils for mechanical analysis, E. H. TYNER. (W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 106-113).—Sodium metaphosphate was prepared by heating C. P. sodium dihydrogen phosphate in a platinum dish in an electric furnace. Slowly at first, until the tendency to spatter had stopped, the temperature was then raised to from 650° to 700° C. and held there for from 1 to 2 hr. The melt was permitted to cool rapidly, the sodium metaphosphate solidifying to a clear brittle, glassy product. The author points out that the dispersive action of sodium metaphosphate is in all probability due to the formation of undissociated complexes yielded only by the glassy form of the salt, to produce which a rapid cooling of the melt is probably necessary. Because of the tendency of the normally acidic solutions of sodium metaphosphate to revert slowly to the orthophosphate, fresh solutions should be used or the solutions adjusted to pH 8 to 9 by additions of sodium carbonate.

It was found that for 10-gm. soil samples, 50 cc. of 0.1 N sodium metaphosphate and overnight shaking are adequate for ultimate dispersion of the <2 μ clay fraction of podzolic, calcareous, and southern red and yellow podzolic soils. Dispersion was inadequate only for a soil which contained 3.3 percent CaSO₄ in addition to 12.8 percent CaCO₃. No significant aggregation of the <2 μ clay fraction occurred on suspensions of noncalcareous soils in 6 days. With calcareous and gypseous soils there was a small increase in the content of <2 μ clay. The increases were within the limits of experimental error and more than offset any aggregation of the colloidal fraction. The stability of noncalcareous soil suspensions was unaffected by aging up to 6 days. Complete flocculation of calcareous soil suspensions occurred on the sixth day, however.

A new sedimentation tube for analyzing water-stable soil aggregates, R. E. MOORE and R. W. KONG. (Univ. Calif.). (*Soil Sci.*, 51 (1941), No. 3, pp. 181-187, pl. 1).—This paper describes a sedimentation tube and technic for making water-stable aggregate analyses which are comparable to those of Cole and Edlefsen (*E. S. R.*, 74, p. 598). From four to five analyses can be made daily, whereas a minimum of 2 days is required to make a single analysis by the Cole and Edlefsen procedure. Three photographic views of the apparatus are reproduced, but working drawings are not included.

Soil aggregation as affected by certain crops and organic materials and some chemical properties associated with aggregation, J. C. HINE and W. H. METZGER. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 19-

22).—Fallowing without leaching caused the greatest, and growth of grass the least, degree of aggregation. In several soils the well-aggregated material was found to have a relatively higher carbon and total nitrogen content than the poorly aggregated. It also possessed a higher content of difficultly oxidizable organic carbon and a wider carbon nitrogen ratio than the poorly aggregated material. The well-aggregated material was relatively high in total sands and clay but low in silt. Differences in base exchange capacity appeared to be due to differences in clay content.

Variations in the state and stability of aggregation as a result of different methods of cropping. C. M. WOODRUFF. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 13-18, figs. 7).—The author shows that by the use of a method of analysis that eliminates the common variables associated with aggregate analysis it was possible to characterize the aggregation of a soil or the stability of soil crumbs by an equation of the type $P = \frac{A}{t^n}$, in which "P" represents the state of aggregation after increasing amounts of wet sieving, A represents the state of aggregation as a result of immersion in water, and n represents the susceptibility of the aggregates to destruction by sieving for increasing lengths of time t."

Cultivated soils receiving treatments of manure through the past 50 yr. or soils cropped to a rotation including the regular use of green manure were found to possess a higher state of aggregation than the untreated plats cropped continuously. Very little difference in the resistance to abrasion of the water-stable aggregates from the different plats was observed. Natural aggregates from a virgin profile of excellent structure were found to be much more resistant to abrasion than the aggregates from the cropped plats, however. Plats cropped to various systems for 15 yr. and then fallowed for 6 yr. showed differences in the stability of the soil crumbs as a result of the 15 yr. of cropping. The most pronounced effect was apparent for the plat previously in bluegrass followed by the one in a rotation of corn, wheat, and clover. All traces of water-stable crumbs had disappeared from the plats cropped continuously to the same crop.

Influence of grinding soil minerals to near molecular size on their solubility and base exchange properties. M. L. JACKSON and E. TRUOG. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 136-143).—Grinding was carried out for from 2 to 14 days in a special ball mill, the bowl of which was made of hardened tool steel, the balls of chrome steel. A rubber-lined mill supplied with agate balls was also used. Wet-grinding was employed, with benzene in the steel mill and water in the rubber mill. Practically all of the crystal-lattice bases of the silicates were made exchangeable or soluble in ammonium acetate solution by very fine grinding in the steel mill, and relatively high base exchange capacities resulted. It is pointed out that this indicates that molecular subdivision was being approached. The silica and alumina of the silicates became relatively soluble in very dilute acids, dilute Na_2CO_3 solution, and neutral salt solutions, from which it is concluded that the exchange capacity developed by grinding was extremely unstable compared to that of the highly resistant natural base exchange minerals of clays in which the exchange bonds are believed to arise from relatively dense plates whose structure is stable toward chemical action. "This increased solubility suggests that grinding disrupted the more stable valence bond relationships in the silicates; consequently, the increase in specific surface, as the particle size is greatly

reduced, must be regarded as a change in kind of surface rather than the simple increase in the extent of surface produced when material of small molecules, such as quartz or BaSO_4 , are subdivided by grinding." The indicated need for caution in interpreting soil processes and reactions on the basis of the behavior of finely ground mineral colloids is emphasized.

Pore-size distribution as related to the permeability of soils, J. F. LUTZ and R. W. LEAMER. (N. C. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 28-31, figs. 6).—In the coarser fractions of a series of sand separates and subsoils, permeability was found to increase exponentially with an increase in particle size. In the subsoils an important factor determining permeability appeared to be that of the swelling of the colloidal material, resulting in a clogging of the pores with swelling water.

The sedimentation volumes of soils from certain major soil groups, L. B. OLMSTEAD. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 89-95).—The sedimentation volumes (reciprocals of the volume weights) of soils and of their extracted colloids that have settled for 24 hr. in water and in xylene were determined in 10 profile samples representing a number of the great soil groups. Sedimentation volumes of the soils, in both water and xylene, were also determined after centrifuging for 30 min. at 70 times gravitational force. The physical and chemical properties of the soils are discussed. The final maximum volume of the samples high in clay was shown to depend on the degree of dispersion and flocculation of the clay fraction.

Alterations in the crystal structure of clay minerals as a result of phosphate fixation, P. R. SROUT. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 177-182, figs. 2).—Samples of kaolinite and halloysite when ground fixed from 300 to 400 mm of phosphate per 100 gm. of the air-dry material. Similar experiments with a bentonite of approximately the same base exchange capacity as the ground kaolinite and halloysite showed a relatively insignificant fixation of phosphate. Measurements of the loss of water from the system of kaolinite plus potassium acid phosphate accounted for the exchange of phosphate ions for hydroxyl ions of the crystal lattice of kaolinite. It is pointed out that kaolinite has a sheet of hydroxyl ions at one side of the basal cleavage plane and a sheet of oxygen ions on the other, whereas bentonite has a sheet of oxygen ions on both sides of the basal cleavage plane. It is suggested that the relative abilities of the kaolinite and bentonite to fix phosphate are related to the hydroxyl ions available for exchange with phosphate ions.

Ground kaolinite of less than 1μ effective diameter when phosphated was found amorphous to X-rays. Removal of the phosphate by leaching with alkaline solutions at pH 9, followed by washing with dilute HCl of pH 3 to 4, restored the X-ray pattern of kaolinite. Distinct X-ray patterns were obtained from the phosphated halloysite. Seventeen lines appeared, among which a strong and distinct line denoting a plane of repetition at 16.1 a. u. was outstanding. When phosphate was removed from the phosphated halloysite by leaching with alkaline solutions, the resulting dephosphated halloysite was amorphous to X-rays. Leaching of the dephosphated halloysite with dilute HCl gave a crystalline material whose X-ray pattern was identical with that of metahalloysite. Changes observed in the X-ray patterns upon phosphating are described as replacement of hydroxyl ions by phosphate tetrahedra at the cleavage planes, and conversely the restoration of the X-ray patterns of kaolinite and halloysite upon dephosphating is attributed to the replacement of phosphate tetrahedra by hydroxyl ions.

Hardpan and microrelief in certain soil complexes of California, C. C. NIKIFOROFF (*U. S. Dept. Agr., Tech. Bul. 745 (1941), pp. 46, figs. 18*).—The character, origin, and relationship of the microrelief and the hardpan in the San Joaquin soil complex are discussed. The microrelief of the land surface causes an uneven distribution of water during the rainy season. The local differences in thickness, durability, and other characteristics of the hardpan correspond to the distribution of water. Such a correlation indicates that water is the major factor of the hardpan formation. Hydrolysis of certain minerals during rainy seasons produces the cementing material which causes an irreversible induration of the hardpan during the hot and droughty periods. Conditions similar to these do not exist in the environment in which the normal zonal soils develop, therefore a maturing of such soils is not accompanied by the formation of the hardpan. Consequently the hardpan, being a local or intrazonal formation, cannot be regarded as a characteristic of the climax profile of every mature soil.

Some field observations of the agronomic significance of compact subsoils, J. W. MOON. (*U. S. D. A.*). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 237–241).—A review of the work relating to the practical significance of compact soil horizons. Knowledge of the nature of the subsoil is important in arriving at a satisfactory system of land use and management. The nature of compaction differs widely in different soils.

A dielectric method for determining soil moisture, J. E. FLETCHER. (*U. S. D. A. coop. Ariz. Expt. Sta.*). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 84–88, figs. 8).—The author uses a crystal controlled primary circuit oscillating at 3.9 mc. and a receiving circuit in which a soil condenser, a precision type variable condenser having a straight-line-frequency plate shape and a total capacity of 500 $\mu\text{f.}$, and a vacuum tube voltmeter are connected in parallel across the terminals of a receiving inductance. Resonance is therefore indicated by a minimum reading of the voltmeter, and any change in the capacity of the soil condenser must be balanced by an equal and opposite change in the capacity of the variable condenser from the reading of which, when adjusted to resonance, the dielectric constant is computed. Diagrammatic drawings of two types of condenser and photographic illustrations of the completed measuring instrument accompany the paper.

An electrothermal method for following moisture changes of the soil in situ, B. SHAW and L. D. BAYER. (*Ohio State Univ.*). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 78–83, figs. 5).—The authors modified a device previously used by them (*E. S. R.*, 83, p. 25) for the determination of soil moisture from the effect of its heat conductivity upon the temperature and the corresponding electrical resistance of an electrically heated coil submerged in the soil. The new form of the apparatus permits its use in the field, though a new calibration curve must be made for each soil. It is shown that the balancing resistances of the instrument can readily be adjusted for any soil temperature, making the results independent of natural variations. Both the temperature difference between the buried coil and the soil and the time during which the heat is applied are kept at values low enough to permit considering the moisture movement induced by the application of this method to be considered negligible. The readings are independent of the salt concentration of the soil solution.

The relation between moisture content and the micro-aggregation or the degree of dispersion in soil, L. KORODNY and J. S. JORRE. (*N. J. Expt. Stas. and U. S. D. A.*). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 7–12, fig. 1).—The authors report experiments showing that dispersion varies with changes in moisture content between the limits of air dryness and saturation, that the

method of wetting has a profound effect on the degree of dispersion, and that artificial pretreatment such as drying and sieving may so modify the dispersion as either to obscure or overaccentuate the effects brought about by a given treatment of the soil in the field. It is pointed out that if dispersion is used as a criterion of changes in structure, the moisture content-dispersion relationship must be kept constant. Trapped air as a hindrance to complete wetting and the effects on a system when a change in phase of its component parts takes place as possible mechanisms to explain the observed phenomena are discussed, together with the importance of dispersion measurements as a means of evaluating the resistance of soils to erosion.

Soil moisture sorption curves for four Iowa soils, M. B. RUSSELL. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 51-54, figs. 3).—The parts of the sorption curves lying below pF 2.70 were established by the use of the porous double-walled auto-irrigator pot (E. S. R., 72, p. 25). Data at pF values below 1.2 were obtained for two of the soils by placing 5-mm. layers of soil in cloth-bottomed containers which were set on the upper end of quartz sand columns having water tables maintained at known distances below the tops of the sand columns. The soil samples were allowed to reach equilibrium moisture contents for each of several pF values. The moisture sorption curves were established by a vapor pressure technic over the range of moisture contents between the permanent wilting point and oven dryness. A centrifuge technic which has been described previously (E. S. R., 83, p. 162) was used for studying the sorption curves between pF 2.8 and 4.2, the capillary potential ψ of the moisture in a centrifuged soil sample being calculated from the equation $\psi = \frac{w^2}{2}(r_1^2 - r_2^2)$, in which w is the angular velocity in radians per second, r_1 is the radial distance to the free-water surface, and r_2 is the radial distance to the center of the soil sample.

A special centrifuge bucket, of which a dimensioned drawing accompanies the paper, was designed for the pF range below 3.8 and up to 4.25.

Thermal conductivities in moist soils, W. O. SMITH. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 32-40, figs. 7).—The author determined the thermal conductivities of each horizon of Hermon sandy loam, Kalkaska loamy sand, and Barnes and Chester loams at moisture contents in equilibrium respectively with 75 and 99.3 percent relative humidity and the moisture content required by 50 and 100 percent of the moisture equivalent. The results made it apparent that a large movement of water in the vapor phase occurs when small thermal gradients are applied to soils having moisture contents in the region just below 99.3 percent r. h. and extending to somewhat above 50 percent moisture equivalent, and that some movement of water occurs in soils having a moisture content required by 75 percent r. h. but practically none at 100 percent moisture equivalent. This vapor-movement is considered a mass transfer of vapor caused by convection rather than diffusion, since the latter is too slow a process. Changes in surface tension of the liquid-forming capillary surfaces on the cool and warm sides of the plate appeared too small for the thermal gradients applied to account for any considerable movement of water.

Value of mean and average soil and air temperatures, A. SMITH. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 41-50, figs. 9).—The author finds average soil temperatures, especially in the surface foot, to be quite different when based upon but two actual measurements (as maximum and minimum) from averages of hourly or quarter-hourly readings. Averages from the figures taken at 15-min. intervals are considered more nearly a true average. In an extremely uniform soil the time of occurrence of the maximum and minimum soil temperatures is practically a straight-line function of the depth,

but the fundamental differential equation for heat conduction does not hold when actual field soil temperatures are taken into consideration. Although the soil material may be uniform in texture, differences in soil structure and soil moisture content change the values for conductivity and volume specific heat, and these may themselves be functions of the temperature. Summarizing soil and air temperature data obtained as above indicated in weekly units is considered to represent accurately the thermal environment of a tree.

Forest soil fertility: Influence of stand composition on nitrogen transformation in the surface soil. T. S. COLE (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 225-229, fig. 1).—Nitrogen transformations in the surface 5 in. of soil under a stand of shortleaf pine 115 yr. old and under an uneven aged stand of the red gum-yellow poplar types from the Duke Forest are presented. The shortleaf pine type was found on Whitestore sandy loam, while the red gum-yellow poplar forest is on Congaree sandy loam. Profile descriptions of each soil are given. The influence of the forest stand on soil fertility is brought out from these investigations. Tree species whose litter is high in bases make conditions more favorable for complete decomposition of the organic matter and the incorporation of the organic matter into the mineral soil. The red gum-yellow poplar was found to favor the formation of soil nitrates. This is explained by the fact that conditions appear to be more favorable for the development of nitrate-forming bacteria.

Nitrate nitrogen content of rain and runoff water from plots under different cropping systems on soil classified as Vernon fine sandy loam. H. A. DANIEL, H. M. ELWELL, and H. J. HARPER. (U. S. D. A. and Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 230-233, figs. 2).—Nitrate nitrogen content of rainfall and run-off water under controlled cropping systems is reported for Vernon fine sandy loam at the U. S. D. A. Soil Conservation Experiment Station, Guthrie, Okla., as collected from 1930 to 1937. The amount of nitrate nitrogen found in the rainfall was greater than the amount removed in the run-off water, thus indicating that the loss from the surface soil by erosion is not large. Good crop rotations and adequate vegetative cover for water conservation were found effective in reducing the loss of nitrate nitrogen.

Changes in the lignin of some plant materials as a result of decomposition. J. B. BARTLETT and A. G. NORMAN. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 210-216).—Consideration is given to the importance of microbiological decomposition of plant materials in the nature and amount of the various constituents remaining to support microbiological activity. The relationship of lignin to humus formation is discussed. Methoxyl content, reactivity, and exchange capacity were determined for lignin preparations isolated from corn, rye straw, oat straw, and wheat straw that had been previously subjected to aerobic decomposition for a 6-mo. period at room temperature. The exchange activity of the lignin was found to be greatly increased as a result of the plant materials decomposing it.

Partial demethoxylation may accompany decomposition of the plant material. Reactivity results indicate that no vital change in the lignin molecule occurred as a result of the decomposition processes, and it is suggested that there is need for more knowledge as to the structure of lignin before many of the changes brought about by decomposition can be explained.

The determination of exchangeable bases by the Lundegårdh spectrographic method. V. R. ELLS and C. E. MARSHALL. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 131-135, figs. 3).—In a spectrographic method attributed by the authors to Lundegårdh, compressed air is passed through an atomizer in which it takes up a spray of the solution of the elements to be determined and into a special burner where it is mixed with acetylene, the mix-

ture being burned from a platinum iridium tip before a metal reflector directing the light emitted to the slit of the spectrograph.

It is shown that by using a recording microphotometer, either the reciprocal (L/H) or the difference ($L-H$) of the line transparencies may be used to compare the unknown concentrations with standards, L being the line transparency and H that of the background. For calcium the L/H method is preferable. An approximate visual method using a comparator plate gave results accurate within 10 percent of the highest concentration used. Using triplicate 5-gm. soil samples, the authors found that the maximum errors to be expected are 5 percent in using the microphotometer and 15 percent in using the approximate visual method.

Primary minerals of the silt fraction as contributors to the exchangeable base level of acid soils, E. R. GRAHAM. (Univ. Mo.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), p. 144).—Bases were found to be transferred from the crystals of anorthite and of hornblende when the minerals were mixed with electro dialyzed clay prepared by electrodialysis, the bases being taken up by the clay in an exchangeable state. Microcline and biotite were found very resistant to the action of the hydrogen clay. The silt of an acid Putnam soil contained no calcium bearing feldspars, while the silt of a neutral Marshall soil contained labradorite and oligoclase.

The relation of potassium fixation to the exchange capacity of soils, J. S. JOFFE and A. K. LEVINE. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 157-161).—The authors found that potassium fixation is usually accompanied by a decrease in exchange capacity but that the relationship is random, there being no equivalence indicated. Fixation is peculiar to K^+ ; other cations (Na^+ , Ca^{++} , Mg^{++} , Ba^{++} , and Sr^{++}) do not appear to be fixed. Considerable evidence indicates that K fixation takes place through the mechanism of the exchange complex.

Determination of exchangeable magnesium in soils by Titan yellow with reference to magnesium deficiency in citrus, M. PEECH. (Fla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 189-195, figs. 2).—It was found that the use of 1 N ammonium acetate, pH 7.0, as the extracting solution affords an accurate measure of the exchangeable magnesium content even in the case of soils containing moderate amounts of dolomite. A rapid method for the determination of exchangeable magnesium in soils by means of Titan yellow is described in detail. Gum tragacanth is used as a dispersing colloid to stabilize the color and to prevent the precipitation of the lake. The efficacy of the proposed method in predicting the magnesium deficiency and the need for magnesium fertilization early in the season before the appearance of the symptoms of magnesium deficiency was tested in a survey of 519 commercial citrus groves. A good correlation between the amount of exchangeable magnesium in the soil and the occurrence of the symptoms of magnesium deficiency in citrus was found.

The Pecos River joint investigation, 1939-1940: Soil salinity investigation, C. S. SCOFIELD (U. S. Dept. Agr., Bur. Plant Indus., 1941, pp. [2]-191).—Salinity was studied in the Roswell, Carlsbad, Mentone, Pecos, Barstow, Grandfalls, Imperial, Toyah, and Fort Stockton areas, all in the Pecos River Basin, and most of them irrigated by diversion from the Pecos River. In order that the conductivity data might be comparable, all measurements were made at the saturation percentage of water, this percentage being defined as the quantity of water, expressed as percentage of the dry weight of the soil, that is required to fill the interstices of a loose or stirred but undrained mass of soil, to exclude all the free air, and yet not yield free water on the soil surface after standing.

In situations where the concentration of the saturation-percentage extracts of the soil, as measured by electrical conductance ($K \times 10^6$ at 25°C.), ranged below 400, there was little or no evidence of salt injury to any crop plant. In situations where the conductance of the extracts ranged from 400 to 800, the less salt-tolerant crop plants did not thrive and the choice of crops was limited to those of the more salt-tolerant group, such as cotton, sugar beets, alfalfa, and some of the grasses, and to cereals including the sorghums. These salt-tolerant crops may be grown, but seldom thrive or yield well, in situations where the extract conductances range from 800 to 1,500. Where the conductances range above 1,500 plant growth is limited to a few species of salt-tolerant grasses, succulents, shrubs, and trees. It is emphasized that these are the limits observed in the Pecos Valley, and that the limits may be different where the climatic conditions and the relative quantities of dissolved salts are not the same. The salts found in Pecos Valley irrigated soils are largely the sulfates of calcium and magnesium. Sodium is generally abundant, but sodium chloride predominates rarely, except in cases of very high total salinity. The proportions of carbonate and bicarbonate are usually low except in areas having very low total salinity where the proportion of bicarbonate may be high. There is almost no "black alkali," nor is there evidence of boron toxicity or of boron deficiency. Potassium occurs frequently, in measurable quantities, but has not been found in toxic concentrations. The excessive salinity now found in irrigated soils of the Pecos Valley is attributed in part to the natural constituents of the soil material (soft rock). The greater part of it, however, is believed due to local evaporation of irrigation water, itself containing from 4 to 8 more tons of dissolved salts per acre-foot, under conditions of inadequate root-zone drainage. The river water can be used indefinitely on soils of permeability adequate to permit proper leaching, and the available water should be allocated to such land in quantities sufficient to provide for adequate leaching.

Soil acidity at various depths as influenced by time since application, placement, and amount of limestone, B. A. BROWN and B. I. MUNSELL. ([Conn.] Storrs Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 217-221, fig. 1).—Since much grassland is not tilled it is important to know to what extent lime placed on the soil surface will affect soil conditions. Samples were collected from tilled fields and grassland, and the soils were studied in 6-in. layers for pH and lime requirements. An alfalfa plat on Charlton fine sandy loam where limestone was mixed with the plow layer at from 4 to 10 tons per acre between 1914 and 1919 showed that the acidity of all layers has been reduced by all the treatments except the 4-ton application. The reduction in acidity was related to the amount of limestone applied. When the samples were taken in 1937 the plow layer was the most acid regardless of the rate of application. Permanent pasture plats limed at the rate of 1 ton per acre in 1924 and again in 1929 showed a reduction in acidity in the surface 6 in. One-in. depth samples of surface soil from the grass plats, limed on the surface, reveal that the depth and rate of limestone penetration are functions of the amount added and the time since the application. For the soil studied, at least, 10 yr. must have elapsed after a surface application of 2 tons before the surface 6-in. layer had a similar reaction. However, it is concluded that in northeastern United States surface application for permanent grasses is a more efficient method of adding lime than is mixing it with the soil.

Soil reaction (pH) preferences of plants, C. E. SPURWAY (*Michigan Sta. Spec. Bul.* 306 (1941), pp. 36).—The common name, botanical name, and optimum pH range are given for about 2,000 plants. In some cases the minimum and maximum pH limits are also included.

The partial sterilization of soil by chloropicrin, N. R. SMITH. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), p. 188).—A clay loam soil composted with manure, dried and sifted, was used for the investigation. A temperature above 20° C. and a soil-moisture content of from 10 to 15 percent are given as optimum conditions for soil sterilization with chloropicrin. Results with various concentrations of chloropicrin are reported.

Methods of estimating the productive capacities of soils, R. W. SIMONSON and A. J. EGGLEHORN. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 3 (1938), pp. 247-252).—A review of the literature and soil productivity rating methods is presented. It is suggested that as definitions of soil types become more precise it will be possible to locate them more accurately and at the same time, perhaps, to improve the estimates of productive capacities now available. More studies on crop yield are essential before observations and judgment can be eliminated in assigning productivity ratings.

Rapid soil tests for determining the fertilizer requirements of vegetable crops in eastern Virginia, E. R. PUEVIS and J. M. BLUME (*Virginia Truck Sta. Bul.* 106 (1941), pp. 1748-1756, figs. 2).—Detailed procedures for making rapid soil tests for aluminum, calcium, magnesium, phosphorus, potassium, available nitrogen, and soil organic matter are presented. An explanation to assist in the interpretation of the quick soil test for each of the elements is given.

1941 recommendations for the use of fertilizer on farms of Mississippi, C. DOBMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 1, pp. 1, 7, fig. 1).—Ten agricultural or soil areas in Mississippi are grouped into such divisions as field experiments have indicated to require approximately the same fertilizers. Recommendations for the different areas are given according to the requirements of various crops.

Fertilizer placement under irrigation in Washington, C. E. NELSON and L. C. WHEELING. (Wash. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 105-114, fig. 1).—The first part of the experimental work here reported upon dealt with the fertilizer movement resulting from the application of nitrogen, phosphorus, and potassium fertilizers in a localized band in the soil, followed by 12- and 24-hr. applications of irrigation water. The second part dealt with the localized application of various amounts of nitrogen and phosphorus fertilizers at different distances to the side, under, and over the seed of corn and beans. Potassium was omitted in the second series of experiments because neither test crop responds to this element in the Sagemoor sandy loam soil used.

It was found that highly soluble nitrogen and potassium fertilizers did not penetrate downward with the water to any appreciable extent, but they did tend to move laterally with the water. The strongest concentrations were found from 4 to 8 in. from the fertilizer band after the water had penetrated over 4 ft. into the soil with 12- and 24-hr. irrigations.

Fertilizers placed with the seed, 1 in. above or 2 in. directly below, were unsatisfactory. With applications of 84 lb. nitrogen per acre as ammonium sulfate, the best placement methods for corn were, in the order named, two bands 2 in. to the side and 2 in. below the seed, a single band 2 in. to the side and 2 in. below the seed, and a single band 4 in. to the side and 2 in. below the seed. With applications of 42 lb. of nitrogen per acre as ammonium sulfate, the single band 4 in. to the side and 2 in. below the seed gave the best results, although applications in two bands 4 in. to the side and 2 in. below the seed and a single band 2 in. to the side and 2 in. below the seed were satisfactory. No increase in corn yield was evident from the addition of either 52.5 or 105 lb. of P_2O_5 as treble superphosphate per acre with the various localized placement methods.

No definite yield increases of beans were obtained on this soil from the use of the nitrogen fertilizer alone or in combination with the phosphorus fertilizer.

The effect of fertilization on the nitrogen, active phosphoric acid, and active potash of a Lake Charles clay loam, G. S. FRAPS, J. F. FUDGE, and E. B. REYNOLDS. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 130-134).—The authors report the effect of fertilizers added during a period of 8 yr. in varying quantities and proportions up to maximums of 640 lb. of nitrogen, 960 lb. of phosphoric acid, and 512 lb. of potash per acre on a Lake Charles clay loam at Angleton, Tex. Nitrogen, active potash, and pH were not significantly changed either in the surface soil or subsoil. Active phosphoric acid in the surface soil was markedly increased, but the increases accounted for only about 20 percent of the phosphoric acid added. The active phosphoric acid in the subsoils was increased significantly only in the plat which had received 960 lb. of phosphoric acid, and then the increase amounted only to 7 p. p. m.

Ammonification of dicyanodiamide and its derivatives in soil, H. MURATA (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 233-234).—Although the formation of ammonia from cyanamide proceeds at nearly the same rate in normal soil and in water-logged (rice paddy) soils, the derivatives dicyanodiamide and guanlyurea are more readily ammonified under rice paddy conditions, especially at summer water temperatures of from 30° to 40° C. These compounds do not cause injury by interference with nitrification, because in rice growing nitrification is not required and does not occur to an appreciable extent in the water-logged soils used for this crop whether cyanamide derivatives are present or not.

Phosphorus fixation and the assimilation of fixed phosphates, F. MOSER. (S. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 168-172, figs. 2).—Electrodialysis was used as a means of studying the nature of phosphorus fixation in four lateritic soils by determining the release of phosphorus and the simultaneous release of associated cations during a 120-hr. period. These data are considered to indicate that calcium, aluminum, and iron are the important cations in phosphorus fixation. Lloyd clay loam and Cecil sandy loam yielded much calcium along with low amounts of iron, aluminum, and phosphorus, which is held to indicate the fixation of basic iron and aluminum phosphates. Orangeburg fine sandy loam and Marlboro sandy loam released the major portion of the calcium during the first 48-hr. period, but released very high amounts of aluminum, iron, and phosphorus during both periods. This is believed to indicate the formation of $AlPO_4$, with small quantities of $Ca_3(PO_4)_2$. Fixed phosphate in the form of $Ca_3(PO_4)_2$ gave a better growth response in soils than did the predominating $AlPO_4$ form.

Phosphorus content of some southwestern pecan soils and influence of phosphate fertilizers on pecan foliage, A. O. ALBEN and H. E. HAMMAR (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 173-176, figs. 4).—The Yahola, Miller, Ouachita, and Lintonia soils on which experiments were made have a supply of phosphorus apparently sufficient for pecan trees. The Orangeburg and Ruston soils analyzed were found to be low in available phosphate. Pecan trees in experiments on these soils responded to applications of phosphate fertilizers. On soils low in available phosphate, applications of phosphatic fertilizer have a residual effect on the phosphorus content of pecan leaves.

Iron starvation as affected by over-phosphating and sulfur treatment on Houston and Sumter clay soils, W. V. CHANDLER and G. D. SCARSETH. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 93-104, figs. 4).—The application of phosphate to the Houston and Sumter clays produced iron chlorosis in peanuts on both soils but more severely on the Sumter clay. Applications of sulfur to either soil reduced the chlorotic condition of the peanuts, the treat-

ment being more effective on the Sumter than on the Houston soil. Symptoms of chlorosis were not evident in the alfalfa following any of the phosphate treatments, although the iron content of the alfalfa was decreased by the addition of phosphate alone on Houston clay. Analyses of the plants grown on either soil revealed no definite correlation between the relative chlorosis and either the total Fe_2O_3 and P_2O_5 removed by the crops, the percentage contents of these, or the ratio of $\text{Fe}_2\text{O}_3 : \text{P}_2\text{O}_5$ in the plants.

Sulfur applied to either soil was readily oxidized to sulfates, the rate increasing with increasing applications of both sulfur and phosphate. In the early stages the rate of sulfonation was slightly more rapid in the Houston clay, but in the later stages this was reversed with the high applications due to the high acidity developed in the Houston clay. The pH value of the Sumter clay was not appreciably affected by 8 tons of elemental sulfur because of the highly calcareous nature of this soil. That of the Houston clay was lowered by even 1 ton.

Selenium occurrence in certain soils in the United States, with a discussion of related topics.—Fifth report, K. T. WILLIAMS, H. W. LAKIN, and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul.* 758 (1941), pp. 70, figs. 8).—This is a continuation of a series of reports previously noted (*E. S. R.*, 84, p. 14). A review of recent literature on topics related to the occurrence of selenium is followed by analyses of upwards of 1,500 samples of wheat and wheat products, of other cereals, and of many other crops grown in seleniferous areas. The quantities found may vary from scarcely detectable amounts to 30 p. p. m. Because of lack of data, no attempt is made to evaluate these results in terms of toxicity. Evidence is presented to show that selenium is a normal component of wheat and similar products and that it is normally present in human urine. The results of a reconnaissance survey of various areas in Alberta, Saskatchewan, and Manitoba show the existence of large areas of seleniferous soils in these Canadian Provinces. Evidence is also presented showing the existence of a considerable seleniferous area in North Dakota. Extra terrestrial existence of selenium is shown through the analyses of 22 samples of meteorites, in 15 of which selenium was found.

Peat resources in Alaska, A. P. DACHNOWSKI-STOKES (*U. S. Dept. Agr., Tech. Bul.* 769 (1941), pp. 84, figs. 24).—A preliminary investigation on the character and general condition of peat resources in Alaska is presented. The report includes a brief statement of the salient features of the peat areas examined in Alaska, and appraisal of the factors bearing on the origin, condition, and characteristics of peat materials connected with the problem of their prospective uses.

Inspection of fertilizers, W. L. ADAMS and T. WRIGHT, JR. (*Rhode Island Sta. Ann. Fert. Ctr.*, 1941, pp. 21).—Analyses of fertilizers and fertilizer statistics as required by the feed and fertilizer law are given for 1940.

AGRICULTURAL BOTANY

Plants and man, C. J. HYLANDER and O. B. STANLEY (*Philadelphia: Blakiston Co.*, [1941], pp. X+518, [pl. 1], figs. 308).—The aim in preparing this introductory textbook was to give students a survey of certain fundamental concepts and their relation to human existence as a part of a cultural education program rather than merely to prepare them for later specialization in the subject.

Trends in plant science, D. T. MACDOUGAL (*Sci. Mo.*, 52 (1941), No. 6, pp. 487-495).—A review of trends in botanical research from around the turn of the century, their causes, and the outlook for the future.

Wildlife food plants in New England, E. A. MASON (*Jour. Wildlife Managt.*, 4 (1940), No. 4, pp. 392-397).

First aid for corn pickers: Sodium perborate cream gives relief from infection believed to be cocklebur dermatitis, S. ERICSON and R. B. HARVEY. (Minn. Expt. Sta.). (*Cunning Age*, 22 (1941), No. 6, p. 297, fig. 1).—A dermatitis apparently due to irritation by the prickly hairs of *Xanthium canadensis*.

Kansas botanical notes, 1939, F. C. GATES. (Kans. State Col.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 97-98).—Notes on weather conditions of the year, plant phenology, viability of a seed of *Abutilon theophrasti* after 29.5 yr., etc.

Flora of Oregon, F. P. SIEP, W. E. LAWRENCE, and L. F. HENDERSON (In *Physical and Economic Geography of Oregon*. [Eugene]: Oreg. State Bd. Higher Ed. [1940], pp. 99-109, figs. 8).

The grasslands of the Argentine and Patagonia, W. DAVIES (*Imp. Bur. Pastures and Forage Crops* [Aberystwyth], Herb. Pub. Ser. Bul. 30 (1940), 1 p. 49, pls. 7).

The status of *Poa secunda* and of *Poa sandbergii* (Gramineae) in North America: New and noteworthy northwestern plants, part 8, H. ST. JOHN. (Univ. Hawaii). (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 78-81, fig. 1).—The grass which Hitchcock had merged under the Chilean *P. secunda* is restored as a valid species, and a new detailed description is given.

On the taxonomy of common buckwheat (*Fagopyrum esculentum* Moench) and *Fagopyrum emarginatum* Roth, A. I. SALTYSKY (Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 2, pp. 180-182, figs. 2).

The North American subdivisions of *Ranunculus*, L. BENSON. (Univ. Ariz.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 799-807, figs. 17).—Includes new taxonomy and a key to the subgenera.

Species Batorum: The genus *Rubus* in North America, I, II, L. H. BAILEY (*Gentes Herbarum*, 5 (1941), Nos. 1, pp. 64, figs. 22; 2, pp. 65-125, figs. 27).—Monographic taxonomic studies.

The violets of Alachua County, Florida, W. A. MURRELL. (Fla. Expt. Sta.). (*Jour. Elisha Mitchell Sci. Soc.*, 56 (1940), No. 2, pp. 367-370).—Key to the species, with descriptions.

The taxonomy of Zenker's *Leptostroma camelliae*, W. W. DIEHL. (U. S. D. A.). (*Mycologia*, 33 (1941), No. 2, pp. 215-219, fig. 1).—Hitherto unknown except for the original description as occurring on *Camellia* leaves, this fungus is here identified as peridioles of *Cyathus stercoreus*.

Further notes on fungi, S. M. ZELLER. (Oreg. Expt. Sta.). (*Mycologia*, 33 (1941), No. 2, pp. 196-214, figs. 17).—Notes and descriptions are presented on several fungus species (many new), mostly Gasteromycetes, but including a new species of *Endogone*.

The development of a species of *Coprinus*, G. T. JOHNSON (*Mycologia*, 33 (1941), No. 2, pp. 188-195, figs. 9).—The developmental morphology of a species of *Coprinus* close to if not identical with *C. cubensis* is presented.

Notes on some Uredinales, G. B. CUMMINS. (Ind. Expt. Sta.). (*Ann. Mycol.*, 38 (1940), No. 2-4, pp. 335-338, fig. 1).—Notes on the morphology of *Desmella sori* and on *Eubakia crotonis* and three species of *Puccinia*, two of them new species.

Uredinales of New Guinea, II, III, G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia*, 33 (1941), Nos. 1, pp. 64-68, figs. 5; 2, pp. 143-154, figs. 7).—Part 2 (*Ill. S. R.*, 83, p. 636) includes species of *Puccinia* and *Uredo*, with eight new species. Part 3 contains many new species of rust fungi.

Plants and their environment [trans. title], H. PFEIFFER (*Chron. Bot.*, 6 (1941), No. 16, pp. 372-374).—A brief review of recent ecological studies.

Ecology (*Carnegie Inst. Wash. Yearbook*, 39 (1939-40), pp. 167-175).—Progress reports on ecological studies of adaptation and origin, including evaporation and transpiration under controlled conditions, transpiration of cut shoots from adapted forms, and dry weight increment in different habitats, by F. E. Clements, F. L. Long, and E. V. Martin; and climate, climax, and conservation, including the drought decade and sunspot numbers, a method of compensation for drought, installation of experimental grids, the ecological basis for regrassing, and the origin and nature of oak barrens and openings, by F. E. and E. S. Clements.

Symbiotic promiscuity in the Leguminosae, J. K. WILSON. (Cornell Univ.). (*Internat. Soc. Soil Sci., Comm. III, Trans.*, 1939, vol. A, pp. 49-63).—In addition to tests with strains from each plant-bacterial group, 46 strains of *Rhizobium* were isolated from one species and employed in controlled tests to show that promiscuity is widespread. These strains exhibited adaptation not only to *Amorpha fruticosa*, from which they had been isolated, but also to many other species representative of several plant-bacterial groups. Furthermore, growth of strains from *A. fruticosa* on media indicated that they were as variable as might be expected of strains from plants representing each of the 16-20 plant-bacterial groups that were projected. This promiscuity was closely associated with the degree of self- or cross-pollination, and by knowing the degree of cross-pollination it was possible to predict to some degree the extent of promiscuity inherent in a plant. In connection with the flagellation of strains, it was observed that plants which are entirely self-pollinated may also be non-nodulating, that plants which are restricted in cross-pollination symbiose mostly with strains highly flagellated, and that plants which are obligatorily cross-pollinated usually symbiose best with strains highly multi-flagellated, although such plants may symbiose with strains possessing variable degrees of flagellation.

Utilization of carbohydrates and sugar acids by the Rhizobia, C. E. GEORGI and J. M. ETTINGER. (Univ. Nebr.). (*Jour. Bact.*, 41 (1941), No. 3, pp. 323-340).—The growth and fermentation characteristics of six *Rhizobium* species, several strains of *Alcaligenes radiobacter*, and one of *Acetobacter chroococcum* on a number of sugars and salts of sugar acids are reported upon.

Further experiments concerning diffusion of nitrogenous compounds from healthy legume nodules or roots, C. A. LUDWIG and F. E. ALLISON. (U. S. D. A.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 719-725).—In a previous paper¹ it was shown that under a variety of conditions diffusion of nitrogenous compounds from healthy legume roots or nodules does not occur. In the present contribution, mixed cultures of inoculated garden peas with barley, with corn, and with wheat and oats, as well as cultures of red clover, alfalfa, peas, and crown vetch each with wheat and timothy were grown in nitrogen-free sand to study the effects of other factors. Found ineffective in inducing excretion were an increased ratio of nonlegume to legume; altering (within the range used) the amounts of certain elements; increasing the adsorptive capacity of the sand by adding quartz flour or kaolin; inoculations with various strains of bacteria; and a light intensity inducing succulent vegetative growth but not preventing a good rate of N fixation. It is believed that excretion of nitrogenous materials from nodules is not likely to prove important in soils of ordinary productivity. It does not necessarily follow that mixed culture of these crops is not profitable, but the value of the practice may have another basis. There was slight evidence that the phosphorus supply has a specific

¹ Bot. Gaz., 98 (1937), No. 4, pp. 680-695, figs. 2.

effect on nitrogen fixation as distinguished from its effect on the growth of the host plant.

Investigations of the influence of differing potash and phosphoric acid nutrition on the development of root nodules and the activity of the nodule bacteria in soybeans [trans. title], H. POSCHENRIEDER, K. SAMMET, and R. FISCHER (*Zentbl. Bakt. [etc.]*, 2. Abt., 102 (1940), No. 21-22, pp. 425-432).—The author believes to have demonstrated by this study that the amount of nitrogen assimilated depends not only on the quantity but also on the composition of the nodule substance formed. It is further concluded from the relations found between the nutrient content of the nodules and the amount of N assimilated under the influence of the nodule bacteria that the presence of nodules is of primary importance in the assimilation of N by the legumes. This work is considered to confirm the dictum of Hellriegel that the root nodules of the legumes are not to be considered as mere storage tissues for proteins but hold a causal relation to the assimilation of free N.

Investigations of biological nitrogen fixation.—I, The value of different amino acids as nitrogen sources for *Bacterium radicum* [trans. title], N. NIELSEN; II, The nitrogen content of *B. radicum*, and III, Influence of hydrogen-ion concentration and of copper on the growth of *B. radicum* supplied with various sources of nitrogen [trans. titles], N. NIELSEN and G. JOHANSEN (*Compt. Rend. Lab. Carlsberg, Sér. Physiol.*, 23 (1940), No. 7-9, pp. 115-145, figs. 3).

Biochemical nitrogen fixation studies.—III, Production and oxidation of ethyl alcohol by legume nodules, C. A. LUDWIG, F. E. ALLISON, S. R. HOOVER, and F. W. MINOR. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 417-436, fig. 1).—Using both manometric and analytical methods on legume nodules and comparing the results with similar data from small roots of legumes and nonlegumes (E. S. R., 83, p. 322), it was found that ethyl alcohol was present in small amounts in all tissues studied. Under anaerobiosis it accumulated and CO₂ was evolved in about the proportions of an alcoholic fermentation of sugar. Under aerobiosis, with alcohol added, part of the alcohol disappeared in a few hours and the respiratory quotient of the tissues was reduced by an amount depending on the alcohol concentration. At the higher concentration it was commonly reduced nearly to that R. Q. corresponding to the complete oxidation of alcohol, indicating that the alcohol disappearing was completely oxidized. Added alcohol increased O₂ consumption of both roots and nodules but not nearly enough to account for the change in R. Q. With glucose and alcohol, made available together, each affected the R. Q. in the same way as it did in the absence of the other, again without affecting the O₂ consumption proportionately, thus indicating that each inhibited competitively the oxidation of the other. For nodules either with or without added glucose and for small roots with glucose added, the absence of a sparing action of O₂ on carbohydrate was indicated. On the contrary for nodules with sufficient added alcohol and for small roots with or without its addition, the presence of a sparing action of O₂ on carbohydrate was shown. Since the R. Q.'s indicate the absence of any oxidative reconversion of alcohol, it is suggested that the O₂ may have reduced in some way the primary break-down of the carbohydrate. The differences in behavior between nodules and roots in respiration are not believed fundamental. The roots behaved much like nodules with added alcohol. The demonstration that alcohol is oxidized by higher-plant tissues removes an important objection to considering it as an intermediate in normal plant respiration, though not proving it to be such. It is suggested that the occasionally observed sparing effect of O₂ on carbohydrate in respiring plant tissues may

depend on a high concentration of intermediate. If so, no fundamental difference in the mechanism of respiration need be assumed between that in tissues where the sparing action occurs and that where it does not.

Measurement of the response of Lemna to growth promoting substances, P. R. GORHAM. (Univ. Maine). (*Amer. Jour. Bot.*, 28 (1941), No. 2, pp. 98-101, fig. 1).—Using a photographic method devised for measuring the frond area of Lemna, 3-indoleacetic, 3-indolebutyric, and 1-naphthaleneacetic acids were found to stimulate growth. For each substance a specific concentration induced a maximum increase in growth. The degree of epinasty caused by these substances varied directly with the concentration. Vitamin B₁ had no appreciable effect.

Effects of root-growth hormones on the meristem of excised pea roots, F. T. ANDICOTT (*Bot. Gaz.*, 102 (1941), No. 3, pp. 576-581, figs. 6).—Deficiencies in vitamin B₁ and nicotinic acid in these cultures visibly affected the meristem, resulting in a decrease in growth rate and eventually in cessation of growth accompanied by reduction in length of meristem, decrease in number of cell divisions in the meristem, and reduction in total length of the cells as they matured. Roots deficient in nicotinic acid became thin, accompanied by reduction in diameter of root cells and of number of columns of cells in the roots. Meristems of roots deficient in vitamin B₁ became only slightly smaller in diameter in the course of 4 weeks, but their growth rate declined more rapidly than that of roots deficient in nicotinic acid. The mature portions of these roots developed irregular thickenings.

Vitamin B₁, nicotinic acid, pyridine, glycine, and thiamin in the nutrition of excised tomato roots, P. R. WHITE (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 811-821, figs. 9).—Experimental evidence indicated that under standard conditions vitamin B₁ failed to improve the growth of two strains of excised tomato roots in any nutrient containing adequate amounts of thiamin, and nicotinic acid and pyridine did not significantly stimulate growth under similar conditions. It is concluded that these three substances are without value as growth-promoting substances for tomato roots of the strains and under the conditions used. This conclusion differs from those of several other investigators, and possible reasons are discussed.

The influence of synthetic phytohormones on the rooting of cuttings [trans. title], A. BARCELLOS FAGUNDES (*An. Prim. Reun. Sul-Amer. Bot.*, 5 (1938), pp. 271-292, pls. 2, figs. 4; *Eng. abs.*, p. 291).—Three growth substances (indole-3-acetic acid, naphthylacetic acid, Roche 202, and "Hortomone A") were tested on 25 plant species, rooting of a few of which is reported to have been favorably influenced in proportion roughly to the concentration.

Effects of potassium acid phosphate, cane sugar, ethyl mercuric bromide, and indolylacetic acid in a talc carrier on the rooting of stem cuttings, N. H. GRACE (*Canad. Jour. Res.*, 19 (1941), No. 4, Sect. C, pp. 99-105).—"Green wood cuttings of *Deutzia lemoinei*, *Symphoricarpos albus*, and *Weigela rosea* and dormant cuttings of *Lonicera tatarica* were treated with a series of 32 talc dusts containing potassium acid phosphate at concentrations of 0, 0.1, 1.0, and 10 percent, in combination with 0 and 10 percent cane sugar, 0 and 50 p. p. m. ethyl mercuric bromide, and 0 and 1,000 p. p. m. indolylacetic acid. The lower concentrations of phosphate tended to increase rooting and reduce mortality of two of the species of green wood cuttings, whereas the 10-percent concentration was ineffective or injurious. However, this concentration was favorable to the rooting of dormant cuttings. Indolylacetic acid treatment increased the number of rooted cuttings and the number and length of roots. Beneficial effects were indicated for organic mercury and cane

sugar treatments. However, these were attributed largely to the combinations with phosphate and indolylacetic acid. The results indicate that the effectiveness of dusts containing indolylacetic acid in the treatment of plant stem cuttings may be increased by the addition of nutrient and disinfectant chemicals."

Dependence of the *Avena* coleoptile growth-rate on the previous auxin supply. C. L. SCHNEIDER (*Amer. Jour. Bot.*, 27 (1940), No. 3, pp. 711-718, figs. 9).—To elucidate further the mechanism of cell elongation initiated by auxin, pretreatments supplementary to those of Went were performed. By using the maximum angle of the oats test as an assay method for the pretreatment effect, it became possible to investigate the effect of pretreatments with physiological concentrations of indoleacetic acid. The results extended the evidence consistent with the Went hypothesis of a "food factor" transport brought about by auxin. It is suggested that such an active second factor translocation or mobilization might be controlled by a combination of auxin plus cellular polarity, and if such is the case that food mobilization could be a more general explanation of auxin pretreatments.

A quantitative study of auxin and its precursor in coleoptiles. J. VAN OVERBEEK (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 1-10, figs. 5).—The extreme coleoptile tips of etiolated corn and oats seedlings yielded completely different amounts of auxin by the methods of exhaustive diffusion and exhaustive extraction. The total amount obtained by diffusion was always larger than that by extraction, showing that auxin is actually produced by the coleoptile. When the tips have stopped giving off auxin by diffusion, they still contain auxin obtainable by extraction, and the total obtainable by diffusion plus extraction is called potential auxin, only part of which is active at any given moment. The amount found by extraction at the beginning of the experiment corresponds to the active auxin in the plant. The difference between potential and active auxin represents auxin precursor, so that by combining the two methods a way is found by which auxin precursor in coleoptiles can be determined quantitatively. The actual amounts found in corn and oats coleoptile tips are recorded. Auxin production also occurred in isolated sections of coleoptiles (exclusive of the tip) as short as 1 mm., starting to produce it at about 2 hr. after being cut off and continuing for over 10 hr. After decapitation the precursor content close to the cut surface steadily increased. The temporary lag in growth and auxin production following decapitation must be due to lack of activation of the precursor rather than of the precursor itself. This activation of auxin precursor occurs at the apical cut surface and can be considerably delayed by injuring the apical cells by heat or AgNO₃.

Histological changes in tomato stems incident to treatment with β -naphthoxyacetic acid. S. C. BAUSER, W. L. REINHART, and G. A. TICE (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 769-779, figs. 41).—The histological responses of very young, immature, and older tomato stems to 0.1 and 1 percent β -naphthoxyacetic acid are described. The transport of the growth substance was greatest basipetally, least radially, and approximately equal tangentially and acropetally. The gradient of response laterally and above or below areas treated with the 1 percent concentration was interpreted as due to the dilution of the substance in the course of its movement.

The effects of pantothenic acid on respiratory activity. H. F. PRATT and R. J. WILLIAMS. (Oreg. State Col.). (*Jour. Gen. Physiol.*, 22 (1939), No. 5, pp. 637-647).—Using a Warburg-Barcroft apparatus, two yeasts in three media were strikingly stimulated by minute amounts of pantothenic acid. Nine other compounds tested on one of these yeasts (found deficient in all factors which it

could not readily synthesize) proved to exert a lesser and in some cases no appreciable stimulative effect. Thiamin was the most active of these substances, and its action differed from and in some ways was antagonistic to that of pantothenic acid. Liver extract contained substances capable of speeding up respiration and growth much more than seemed possible with known compounds. Pantothenic acid had a definite stimulative effect on fermentation by dialyzed maceration juice from yeast. It also stimulated respiration of apple and potato tissue and gave indications of a similar effect on certain animal tissues.

Factor Z in hybrid maize, W. J. ROBBINS (*Bul. Torrey Bot. Club*, 68 (1941), No. 4, pp. 222-228, figs. 3).—Extracts of the grains of two inbred strains of corn and their heterotic F_1 hybrids increased the early growth of *Phycomyces* in solutions of sugar, minerals, asparagine, and thiamin, those from the hybrid grains producing a greater effect than those of either parent. The effects of extracts of autolyzed grains differed somewhat from those of grains allowed to germinate for 24 hr.

Further observations on factor Z, W. J. ROBBINS (*Bot. Gaz.*, 102 (1941), No. 3, pp. 520-535, figs. 4).—"Methods of estimating factors Z_1 and Z_2 in solutions of unknown composition are described. Neopeptone was found to be rich in Z_1 and less rich in Z_2 . A pyridine extract of Difco agar was found to contain factor Z_1 but little Z_2 . This extract influenced the mature dry weight of *Phycomyces* in the presence of excess thiamin. The cathode liquor from shredded agar contained Z_1 but little or no Z_2 . The anode liquor contained neither. Z_1 was not found to be identical with biotin, pantothenic acid, glutamin, or para-amino benzoic acid. Z_2 was not found to be identical with glutamin or para-amino benzoic acid."

Histological reactions of bean plants to l-tryptophane, E. J. KRAUS. (U. S. D. A. et al.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 602-622, figs. 15).

Synthetic and hydrolytic action of invertase at various hours of the day in *Bromus inermis* Leyss., A. S. MOROZOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 2, pp. 175-176).—The results of this study led to the conclusion that daily changes in the trend of invertase activity are intimately related to the accumulation of sugars in the leaves, and the evidence is believed to indicate an outstanding role of this enzyme in the photosynthesis of carbohydrates. Daily variations in the reversible action of invertase are likely to be reflected in carbohydrate translocation to the storage organs.

Influence of temperature in various phenophases on reversible action of invertase in the fodder grasses as related to their resistance to heat, A. S. MOROZOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 2, pp. 177-179).—From experiments on timothy grass the invertase activity was found to be largely controlled by temperature at various developmental stages, but at tillering the dependence of the reversible action of the enzyme on temperature is especially strong. The direction of enzymic activity toward synthesis or hydrolysis appears to be determined essentially by temperature influences.

Influence of air humidity on uptake of nutrient elements by spring wheat, T. T. DEMIDENKO and R. A. BARENKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 2, pp. 183-186).—With P and K fertilization spring wheat yielded more grain under dry than under humid conditions, whereas with N the yield of grain or green bulk was higher under humid conditions. The transpiration coefficient was greatly reduced with N available, whereas it was higher with P and K under either dry or humid conditions. The value of the transpiration coefficient was inversely proportional to that of yield. The air humidity affected transpiration, uptake of nutrients, their translocation, and the synthesis of organic materials. Analyses indicated that absorption of min-

erals increased with the transpiration coefficient, but if there was an excess of some element in the soil it was absorbed more intensively. With high transpiration the content of mineral elements went up in the leaves and roots, as did the ratio of ash elements : dry matter.

Radioactive phosphorus as an indicator of phosphorus absorption of tomato fruits at various stages of development, D. I. ARNON, P. R. STOUT, and F. SIMOS. (Univ. Calif.). (*Amer. Jour. Bot.*, 27 (1940), No. 3, pp. 791-798, figs. 5).—Following a general discussion of the method, results are given of an investigation of tomato fruits on adding radioactive and common isotopes of P to nutrient solutions and tracing their absorption by the plant. After 40 min., newly absorbed P was detected in the leaves and tips of tomato plants over 6 ft. tall, and fully ripe fruit on the vine continued to absorb measurable amounts. The younger the fruit the greater was its absorptive power, P being taken up in both seed and pulp of green fruit but only by the pulp in ripe fruit. With restricted supply, both ripe and green fruit drew on the P supply of the leaves, but with liberal supplies both leaves and fruit showed a gain. A technic for producing contact "radiographs" of the distribution of newly absorbed P in the tissues is described.

Influence of sulphur deficiency on metabolism of the sunflower, S. V. EATON (*Bot. Gaz.*, 102 (1941), No. 3, pp. 536-556, fig. 1).—The visible effects of sulfur deficiency in the sunflower were similar to those noted for the soybean (*El. S. R.*, 74, p. 614). In sunflower, soluble organic N fractions and nitrates accumulated in the minus-S as compared with the plus-S stems. Soluble S compounds were also higher in the S-deficient stems. Though the minus-S stems were somewhat higher in starch and acid-hydrolyzable carbohydrates than the plus-S, they were so much lower in sugars that they were to be considered low-carbohydrate stems. Accumulation of nitrates and carbohydrates in minus-S plants seemed to be due to low nitrate assimilation, resulting from a low reductase content. Accumulation of soluble organic N fractions and soluble S compounds is believed due mainly to proteolysis. Proteolysis and reutilization seem to be more prominent features of S deficiency than for most other deficiencies. Since the gradients of the N and S fractions are negative upward rather than positive upward, they offer no support to the theory of proteolysis in the lower levels of the S-deficient stems and transport of the resulting material to the tips to be used in stem elongation. The gradients of N and S compounds were in the same direction as that of the metabolically active cells, viz, positive downward, and it is believed that the gradients result from the metabolic activities of these cells. Accumulation in minus-S stems of soluble organic N fractions indicates that rapid proteolysis is going on there. Proteolysis in a S-deficient plant is discussed. Though the starch and reducing sugar gradients of the stem were in the direction of the metabolically active cells (positive downward), the acid-hydrolyzable gradient was in the reverse direction, that of nonliving cells, which is regarded as evidence that under the test conditions these carbohydrates are not so important in metabolism as starch and reducing sugars.

Calcium as a factor in seed germination, W. A. ALBRECHT. (Mo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 153-155).—The experimental evidence presented suggests a possible significance of Ca in the soil for better seed germination. Since its effects cannot be ascribed to changes in soil reaction, they must be related to a nutrient role, thus giving Ca in the soil an importance for possible practical attention in terms of exceedingly small amounts for significant benefits.

Germination tests with old seeds [trans. title], J. SCHWEMMLE (*Ztschr. Bot.*, 36 (1940), No. 5, pp. 225-261, figs. 22).—It was found that the older seeds of *Oenothera berteriana* were, the slower and poorer was their germination, and also more and more seedlings died with characteristic injuries until none of those from the oldest seeds survived. By germination tests with seeds treated with extracts or mash from old seeds it was shown that they contained a substance inhibiting germination. Seeds of *O. odorata* also decreased in germinability with age, but seedling development was much less affected. By tests with crosses it was found that this inhibitory effect on germinability was strongest in the complex heterozygotes.

On the relation between growth and respiration in the *Avena* coleoptile, B. COMMONER and K. V. THIMANN (*Jour. Gen. Physiol.*, 24 (1941), No. 3, pp. 279-296, figs. 10).—Growth of oats coleoptile sections in sucrose and auxin solutions was inhibited by various substances known to be dehydrogenase inhibitors, and the four-carbon acids were found to provide a respiratory system which is part of the chain of growth processes and which is in some way catalyzed by auxin. It represents a small but variable fraction of the total respiration.

The respiration and anaerobic fermentation of tea leaf and their relationship to tea fermentation, S. B. DEB and E. A. H. ROBERTS (*Biochem. Jour.*, 34 (1940), No. 12, pp. 1507-1516).

Metabolism of nonvolatile organic acids by excised barley roots under a constant gaseous environment, A. ULRICH. (Univ. Calif.). (*Chron. Bot.*, 6 (1941), No. 16, p. 368).—A brief summary of studies and outline of methods.

The importance of amino-acids as yeast nutrients, H. K. MITCHELL and R. J. WILLIAMS (*Biochem. Jour.*, 34 (1940), No. 12, pp. 1532-1536).—The effects of 20 amino acids (alone and in mixture) and of a casein digest on five strains of *Saccharomyces cerevisiae* and one strain of *S. ellipsoides* were studied and the results are reported.

Morphological and microchemical studies of *Derris tubli* root from the Philippines, R. M. LLANES (*Univ. Philippines, Nat. and Appl. Sci. Bul.*, 7 (1940), No. 4, pp. 349-374, pls. 7, figs. 8).—Report of studies, with special reference to the insecticidal properties. Rotenone was abundant in the wood parenchyma and pith ray cells of the wood but less so in the cortical and pith ray cells of the bark.

Metabolism and flowering, J. GRAINGER (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 311-322, figs. 9).—Mobile carbohydrate was demonstrated in 11 plant species native to temperate regions and which form their flower initials at all times of the year. No floral delay in nocturnal translocation was found in such species as are florally determined in the short days of fall and winter. A plant generally expends only a small percentage of its dry weight in flower production, but this may pledge such a large amount of future development that the plant is unable to meet all metabolic demands. In the latter case flowers then fall by abscission at the base of each pedicel. This loss can be prevented in apples by thinning. Evidence of a close relation between onset of flower formation and marked increase in vegetative growth rate is presented for *Epilobium angustifolium*, and it was found that the vegetative growth rate of first-year plants of *Sisymbrium altissima* could be stimulated by inoculating them with extract from an inflorescence of the same species. Flower initiation in *E. angustifolium* occurred at the time when the amount of stored carbohydrate in the plant was at a minimum. These results strengthen the conclusion that flower initiation and emergence are governed by different sets of conditions. It appears improbable that flower initiation is caused by any considerable preponderance of one metabolic product over another, but there is evidence

that a more delicate and qualitative difference in metabolism characterizes the change from vegetative to floral organization of the growing point.

Flowering behavior of *Specularia perfoliata* in relation to light intensity and light duration, J. A. TRENT (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 199-205, figs. 2).—Plants grown in periods of short duration or low intensity of light produced fewer flowers of both open and cleistogamous type than those grown in full sunlight. The latter type is considered a retarded form of open flower. It is concluded that the effects of short periods of light and low light intensity are indirect in that the plant nutrition is altered.

The development of seedlings as influenced by day length and temperature [trans title], E. GERHARD (*Jour. Landw.*, 87 (1940), No. 3, pp. 161-203, figs. 6).—These studies were carried out on wheat, chrysanthemum, and *Ullucus tuberosus* (Basellaceae).

The chemical composition of the plant growing-point and its relation to the daily light exposure, G. F. SHEARD (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 305-310, figs. 2).—"No general causal relationship can be found between the onset of flowering under a favorable photoperiod and a suitable ratio of soluble C/N in the apices of chrysanthemum, cosmos, and tomato. Flower bud appearance in cosmos and late-flowering chrysanthemum may be associated with a high sugar content. Cosmos and tomato provide clear indications of a cycle in protein nitrogen which is affected by the photoperiod when the latter influences the time of flowering."

Effects of some environmental factors on photoperiodic induction of beet and dill, A. W. NAXLOS (*Bot. Gaz.*, 102 (1941), No. 3, pp. 557-575, figs. 6).

Growth of some range grasses in reduced light intensities at Cheyenne, Wyoming, H. M. BENEDICT. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 582-589, figs. 4).—"Plants of *Agropyron cristatum*, *A. smithii*, and *Bouteloua gracilis* were grown at Cheyenne, Wyo., in 100 percent, 57 percent, 42 percent, and 28 percent sunlight in 1938 and in 100 percent, 70 percent, and 50 percent sunlight in 1939, and the height, dry weight, and number of plants that flowered recorded. The plants grown in the shade were taller than those grown in full sunlight but had a smaller dry weight. Reducing the light intensity to a certain extent increased the number of plants of *A. cristatum* and *A. smithii* which flowered, but greatly decreased the number of plants of *B. gracilis* which flowered. Using the dry weight as a measure of growth, the results indicate that these species make their best growth in full sunlight; but that full sunlight, while favoring the flowering of *B. gracilis*, is so intense as to retard the flowering of *A. cristatum* and *A. smithii*."

Effects of light on stem and leaf growth, F. W. WENT (*Amer. Jour. Bot.*, 28 (1941), No. 2, pp. 83-95, figs. 10).—Illuminated daily with small amounts of red and orange light, leaf growth of pea seedlings was greatly increased, the effect being a function of the amount of energy falling on the leaves. Growth in length of stem decreased, and intensity of light was more effective here than its duration. When illuminated only once, the leaf and stem regions growing most rapidly were most affected, and a compensatory growth of the internodes above the shortened zone was observed so that total length was not necessarily reduced by a single illumination. Using different wave lengths, both in a continuous spectrum without intensity correction and in equal intensities of different spectral lines from a mercury vapor lamp, a minimum effect of green light on leaf growth was observed in both cases, whereas growth in length was least affected by blue light. In the same plants phototropism occurred only in the blue and green light, so that the first steps differ from each of the three processes—photoperiodism, leaf growth, and stem elongation,

implying that these processes are unrelated. The discrepancy between this light effect, where growth in length is most inhibited by red and yellow light, and the increased elongation of plants grown for long periods in red and yellow light, as compared with blue or white light, requires a distinction between dark- and red-etiolation, also indicating that the effect of light on growth in length is at least twofold.

For the light growth response of the subapical to basal zones of oats coleoptiles it was also shown that for short exposures to light the product law does not hold, i. e., the intensity is more important for the quantitative expression of the response than the total energy applied.

Stomatal physiology in the coffee tree *Coffea arabica* [trans. title], C. M. FRANCO (*An. Prim. Reun. Sul-Amer. Bot.*, 3 (1938), pp. 293-302, figs. 5; *Eng. abs.*, p. 297).—In shaded leaves the stomata were found to open in the morning, remaining open throughout the day and closing in the evening; exposed to sunlight, they closed at noon. Reaction to light stimuli occurred in less than 5 min. The osmotic pressure of the guard cells was higher in open than in closed stomata.

Effects of ultraviolet radiation on the germination and morphology of spores of *Rhizopus suinus*, A. E. DIMOND and B. M. DUGGAE. (Univ. Wis.). (*Jour. Cell. and Compar. Physiol.*, 16 (1940), No. 1, pp. 55-61, figs. 2).—The time necessary for the first spore to germinate was delayed, and the rate at which germination proceeded was lowered, with increases in the dosage applied. When irradiated, spores partially inactivated by age behaved like those 100 percent viable except that they were somewhat more resistant to treatment. The number of spores germinating abnormally increased with the dosage up to a certain point, and at the same time the number germinating normally decreased steadily. The diameter of hyphae produced by surviving spores increased with the dosage to which the spores had been submitted.

The effect of ultraviolet light on living yeast cells, J. N. DAVIDSON (*Biochem. Jour.*, 34 (1940), No. 12, pp. 1537-1539).—Without disintegration of cells, large amounts of nitrogenous material were liberated into the substrate. This material markedly stimulated yeast growth.

Differential sensitivity of cells to X-rays, K. SAX and C. P. SWANSON (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 52-59, figs. 6).—The descending order of sensitivity in *Tradescantia* was—microsporocytes, microspores, root-tip cells, and generative cells. *Allium* microspores and root tips were less sensitive than in *Tradescantia*. The differential sensitivity of cells to X-rays is attributed to differences in chromosome development, the speed of nuclear changes, and especially the degree of freedom and capacity for chromosome development. This analysis includes only chromosome aberrations induced by direct hits. Physiological and indirect effects of radiation may be of even more importance in producing injury and death of certain cells and tissues.

Influence of moonlight on the photosynthesis in fresh water algae, V. S. IVLEV and M. I. MUKHAREVSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 1, pp. 71-73).—It is claimed that photosynthetic activity occurred at night, at least under full moon.

Rôle of sugar in greening of wheat seedlings, A. A. ZAITZEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 1, pp. 59-62).—The importance of sugar in chlorophyll accumulation is emphasized without precluding the rôle of other factors.

Influence of preparative procedure on the purity of chlorophyll components as shown by absorption spectra, F. P. ZSCHEILE and C. L. COMAR. (Purdue Univ.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 463-481, figs. 4).—This im-

proved method for preparation of chlorophyll component solutions with reproducible spectroscopic properties "is rapid and simple; sucrose is used, both for filtration of precipitated pigment and for separation of components by adsorption. The absorption spectrum in ether solution has been shown to be very sensitive to previous treatment of the solution. It is emphasized that drying must be avoided and that spectroscopic observations must be made very soon after purification. The spectra of acidified chlorophyll solutions are presented, and their relation to ordinary degradation effects is discussed. Some comparisons with reported values are made."

A convenient cooling method in paraffin sectioning, A. M. SCHECHTMAN. (Univ. Calif.). (*Stain Technol.*, 16 (1941), No. 2, pp. 85-86, fig. 1).—The device described utilizes CO₂ as the cooling agent.

Improved paraffin schedules for plant tissues, T. E. RAWLINS and W. N. TAKAHASHI. (Univ. Calif.). (*Stain Technol.*, 16 (1941), No. 1, pp. 7-8).—The two paraffin schedules presented are said to produce less distortion than those commonly used.

An improved trimmer for paraffin blocks, F. A. WATERMAN (*Stain Technol.*, 16 (1941), No. 2, pp. 59-61, figs. 2).—An instrument is described and illustrated which is said to trim the paraffin block so that opposite edges are strictly parallel, thereby preventing the ribbon from curling as it comes off the microtome.

The preparation of stem sections of woody herbarium specimens, F. HYLAND. (Univ. Maine). (*Stain Technol.*, 16 (1941), No. 2, pp. 49-52).—The paraffin procedure described is said to prove satisfactory for herbarium material, seeds, and specimens of old bark and wood varying in hardness from balsam to ebony.

A comparative study of the wood structure of several South American species of Strychnos, R. A. COCKRELL. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 32-41, figs. 18).—Detailed descriptions and numerical data are presented for 26 species, together with the distinctive features of those species identifiable on this basis.

A growth-ring study of an unusually old bur oak in Miami County, Kansas, L. F. SMITH. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 173-175, fig. 1).—This study indicated that the first ring in the sound wood was laid down in 1835.

A section-smear method for plant cytology, H. E. WARMKE (*Stain Technol.*, 16 (1941), No. 1, pp. 9-12, figs. 3).—In the improved method detailed for making root tip preparations of plants with medium or small chromosomes, the division figures are oriented in polar view by cutting paraffin cross sections of roots. The pectic substance is removed from the middle lamellae and the sections are smeared. The prolonged hydrolysis softens the tissue and removes sufficient pectic substance so that cells of the section separate readily and may be flattened until the chromosomes come to lie in one plane. The slide is permanent.

A study of physical and chemical changes in the growing region of primary roots of cowpea seedlings, M. E. REID. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 45-51, figs. 2).—This study is concerned with the magnitude of the changes with respect to volume, dry weight, and surface area which root cells undergo during development.

Plant cell wall structures, E. E. BERKELEY. (U. S. D. A.). (*Ohron. Bot.*, 6 (1941), No. 16, pp. 364-365).—A general discussion, with special reference to fiber plants and with emphasis on some of the problems in which physics and biology must be carefully coordinated with chemistry in cell wall structure studies.

A new method for staining chromosomes and nucleoli, R. R. GATES (*Sci. Mo.*, 52 (1941), No. 4, p. 386).—Note on the Feulgen-Light green stain.

Mechanism of mitosis in pollen tubes, K. SAX and J. G. O'MARA. (U. S. D. A. et al.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 629-636, figs. 10).

Growth factor and other nutritional requirements of the acetone butanol organism, *Cl. acetobutylicum*, A. E. OXFORD, J. O. LAMPEN, and W. H. PETERSON. (Wis. Expt. Sta.). (*Biochem. Jour.*, 34 (1940), No. 12, pp. 1588-1597).—Biotin and another factor present in yeast extract were required by this *Clostridium* for normal growth. There is no strict correlation between growth and fermentation, and other factors may be necessary for growth to take place normally.

Nutritive requirements of the heterofermentative lactic acid bacteria, H. G. WOOD, C. GEIGER, and C. H. WEEKMAN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 367-378, figs. 2).—Three species of *Lactobacillus* were used in the studies reported.

The reaction of certain stains with bacteria, T. M. MCCALLA. (Kans. Expt. Sta.). (*Stain Technol.*, 16 (1941), No. 1, pp. 27-32).—Recent data are presented supporting the idea that staining of bacteria is an adsorption exchange process chemical in nature.

Staining bacteria and yeasts with acid dyes, W. E. MANEVAL. (Univ. Mo.). (*Stain Technol.*, 16 (1941), No. 1, pp. 13-19).—Procedures are detailed for staining or demonstrating vegetative cells, resting and germinating spores, capsules, sheaths, and glycogen in bacteria; germinating and conjugating spores in yeasts; and for counterstaining after acidfast or gram staining. The principal advantages of acid dyes are said to lie in better differentiation and less tendency for slime and debris to take the dyes.

A solution for staining differentially the spores and vegetative cells of micro-organisms, P. H. H. GRAY (*Canad. Jour. Res.*, 19 (1941), No. 4, Sect. C, pp. 95-98).—The solution developed is a mixture of two phenyl methane dyes, malachite green and basic fuchsin, which can be used as a concentrated aqueous or as a dilute saline solution for staining bacteria, yeast, and certain other fungi. Decolorizing and counterstaining are not required.

The electron microscope: A new tool for bacteriological research, L. MARTON (*Jour. Bact.*, 41 (1941), No. 3, pp. 397-413, figs. 12).—The microscope and its technic are described and illustrated.

Bacterial morphology as shown by the electron microscope.—I, Structural differentiation within the streptococcal cell, S. MUDD and D. B. LACKMAN (*Jour. Bact.*, 41 (1941), No. 3, pp. 415-420, figs. 7).—A cytomorphological study utilizing the new technic.

GENETICS

Symposium on experimental control of development and differentiation (*Amer. Nat.*, 75 (1941), No. 757, pp. 107-153, figs. 13).—Of interest to botany: Effect of Induced Polyploidy in Plants, by A. F. Blakeslee (pp. 117-125); and The Hormone Control of Plant Development, by K. V. Thimann (pp. 147-153).

Embryogenesis in coffee.—I, Development of the ovule in *Coffea arabica* [trans. title], E. A. GRANER (*Am. Prim. Rev. Sul-Amer. Bot.*, 3 (1938), pp. 193-201, pls. 5; *Eng. abs.*, pp. 198-199).

Mendelian inheritance of certain pathogenic characters of *Puccinia graminis tritici*, T. JOHNSON and M. NEWTON (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. C, pp. 599-611, fig. 1).—Crossing and selfing physiologic races indicated certain pathogenic characters to be dominant to others. Detailed consideration of the results led to the conclusion that despite the binucleate condition of

stem rust in its uredial phase, the genes function as if they were present in a single diploid nucleus, and that, owing to fusion of the nuclei in the teliospore and subsequent meiotic divisions, independent segregation of factors occurs as in higher plants. The crossing of physiologic races and selfing of hybrids lead to various recombinations of existing pathogenic characters that may result in forming new physiologic races without involving the creation of new pathogenic characters.

A new amphidiploid—Einkorn × Persian wheat (*Triticum monococcum* hornemannii Clem. × *Triticum persicum fuliginosum* Zhuk.), A. S. KASPARYAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 2, pp. 166–169, figs. 4.*)

Mass production of amphidiploids by colchicine treatment in cotton, A. R. ZHEBRUK and M. M. RZAEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 2, pp. 159–162.*)—By treatment with colchicine, amphidiploids were obtained in six interspecific hybrids of *Gossypium*. These species could not hitherto be used in the breeding program because of the absence of amphidiploids.

A colchicine-induced amphidiploid—Upland × Egyptian cotton (*Gossypium hirsutum* L. × *G. barbadense* L.), A. S. KASPARYAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 2, pp. 163–165, figs. 4.*)

List of the chromosome numbers in the genus *Saccharum* and related genera, A. MORIYA (*Jap. Jour. Genet., 16 (1940), No. 3, pp. 126–136.*)

[Papers on animal genetics, physiology of reproduction, and lactation] (*Amer. Soc. Anim. Prod. Proc., 33 (1940), pp. 102–311, figs. 6.*)—In addition to papers noted elsewhere (see pp. 381 and 391), brief reports on the following subjects were presented before the American Society of Animal Production at its 1940 meeting (E. S. R., 88, p. 178): Artificial Insemination in Range Cattle—A Preliminary Report, by J. F. Lasley, J. T. Montgomery, and F. F. McKenzie (pp. 102–105) (Mo. Expt. Sta. coop. U. S. D. A. et al.); Litter and Line Differences in Some Weights and Scores of Pigs, by A. E. Molln (pp. 132–135) (Iowa Sta. coop. U. S. D. A.); Extent to Which Type Differences Among Swine Affect Litter Size, by H. O. Hetzer and G. W. Brier (pp. 135–138) (U. S. D. A.); Conference on Artificial Insemination, by G. W. Salisbury and C. L. Cole (pp. 199–200) (Cornell Univ. and Mich. State Col.); Comparison of Ram Semen Collection Obtained by Three Different Methods for Artificial Insemination, by C. E. Terrill (pp. 201–207) (U. S. D. A.); Seasonal Trends of Sperm Cell Types in Sheep, by W. W. Green (pp. 207–210) (Minn. Sta.); Factors Influencing Motility and Metabolism in Ram Semen, by B. H. Moore, D. T. Mayer, and F. F. McKenzie (pp. 210–215) (Mo. Sta. coop. U. S. D. A.); New Portable Equipment for Measuring Respiration of Sperm Cells, by R. E. Comstock (pp. 216–220) (Minn. Sta.); An Improved Method for Artificial Insemination of the Bovine by Vaginal Deposition of the Semen, by H. P. Davis, G. K. L. Underbjerg, and G. W. Trimberger (pp. 221–223) (Nebr. Sta.); The Ability of Dairy Bulls To Withstand Regular Service for Artificial Insemination During One Year, by E. J. Weatherby, R. P. Beece, and J. W. Bartlett (pp. 224–229) (N. J. Stas.); Longevity, Fecundity, Motility, and pH of Diluted and Undiluted Bovine Semen, by G. K. L. Underbjerg and H. P. Davis (pp. 229–236) (Nebr. Sta.); Organization and Operation of Breeders' Cooperatives, by G. M. Werner and E. E. Helzer (pp. 236–241) (Univ. Wis.); Absorption and Reflection of Solar Radiation in Relation to Coat Color in Cattle—Preliminary Report, by A. O. Rhoad (pp. 291–293) (U. S. D. A.); Intra-Sire Correlations or Regressions of Offspring on Dam as a Method of Estimating Heritability of Characteristics, by J. L. Lush (pp. 293–301) (Iowa Sta.); Potential Fertility of Artificially Matured and Ovulated Ova in Cattle, by L. E. Casida, A. Nalbandov,

W. H. McShan, R. K. Meyer, and W. Wisnicky (pp. 302-304) (Univ. Wis.); and The Time of Ovulation and Rate of Spermatozoa Travel in Cattle, by J. E. Brewster, R. May, and C. L. Cole (pp. 304-311) (Mich. State Col.).

The rôle of nutrition in reproduction, T. S. SUTTON. (Ohio State Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 766, pp. 17-22).—A summary of the role of nutrition in the reproduction of cattle, sheep, and other animals, including especially energy, protein, fat, vitamin, and mineral requirements.

On the relative development of exterior characters in the sheep during the pre-natal period, S. N. BOGOLYUBSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 876-878).—Measurements of body parts were analyzed for Merino, Rambouillet, Precoco, Kazakh, Kurdyuk, and Karakul embryos and fetuses of different ages up to birth. Changes in the proportions were reported as indications of the growth and development of the fetuses.

On the pre-natal development of wrinkles on the skin of sheep, S. N. BOGOLYUBSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 879-882).—The order and development of wrinkles on different regions of the body in the skin of sheep fetuses are described. The number and extent of wrinkling generally varies with the breed, and was correlated with coloring, rhythm, and direction of the hair growth and curling in Karakuls.

Relation of exterior characters of Karakul sheep to quality of fur of their young, E. P. PANFILOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 871-875).—Correlation between body type and wool characteristics and fur condition in lambs was observed in crosses between Crimean Mallich and Karakul sheep. These results showed that relatively massive ewes produced lambs with finer quality of the fur, whereas ewes of middle or small body weight showed some improvement in karacul fur. Dams of medium or small body weight produced lambs with too fine fibers for best quality. Long periods of embryonic development increased the length of the fur fibers and made them inferior for the best trade on account of the lessening of the degree of curl.

Bifurcated xiphisternum and its relationship with short ears in the house mouse, E. L. GREEN and C. W. McNUTT (*Jour. Hered.*, 32 (1941), No. 3, pp. 94-96, fig. 1).—The aberrant formation in the mouse of the xiphoid process of the sternum, termed bifurcated, was found to be so closely associated with the gene for short ears that it was considered another expression of the same gene. Among nearly 1,000 progeny in the backcross and F₂ generations produced by a normal strain and each of three short-eared, bifurcated strains there were no cross-overs between short ear and bifurcated sternum. In the single cross-over between dilute and short ear, short ear and bifurcated sternum behaved as a unit. The few progeny of a cross between two short-ear strains tended toward the symmetrical bifurcation characteristic of one strain. It is suggested that the variations in the expression of bifurcated in the two stocks may be due to differences in the genetic background against which the short-ear gene operates.

Some effects of the gene W^v (dominant spotting) in mice, E. FEKETE, C. C. LITTLE, and A. M. CLOUDMAN (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 2, pp. 114-117).—There were no normal gametes produced in the testes or ovaries of W^v mice (E. S. R., 78, p. 610). The ductus epididymidis was distended with a homogeneous secretion, and cysts were present in the thymus with abnormalities of the pituitaries and other glands. The erythrocyte counts were even lower than those given by Grüneberg (E. S. R., 82, p. 465) for homozygous mice of this type.

Inherited semisterility in mice after X-ray irradiation causing reciprocal chromosome translocations [trans. title], P. HERTWIG (*Zischr. Induktive Abstam. u. Vererbungslehre*, 79 (1940), No. 1, pp. 1-27, figs. 6).—Studies of the progeny of X-rayed mice in which fertility was reduced (E. S. R., 80, p. 607) supported the findings that the lowered fertility resulted from reciprocal translocations within the chromosome pairs in both ♂ and ♀ gametes. Where the chromosomes were unbalanced in the zygotes, the condition was lethal. One-half of the progeny from both parents carrying the genes in this form died.

Genetics of the fowl.—XII, Sex-linked, imperfect albinism, C. D. MUELLER and F. B. HURT. (Cornell Univ.). (*Jour. Hered.*, 32 (1941), No. 2, pp. 71-80, figs. 6).—Continuing this series (E. S. R., 83, p. 609), the authors found a hen with imperfect albinism and pink eyes in a Barred Plymouth Rock flock. The condition was found to be inherited as a sex-linked recessive, thus adding 1 more gene to the 23 known in the 6 linkage groups of fowls and raising to 9 the number located in the sex-linked chromosome. Microscopic study of the eye showed the albinism to be imperfect since some melanin was present. Although similar to the condition caused by the albino gene (E. S. R., 71, p. 308) and the pink eye gene (E. S. R., 84, p. 29), reported by Warren, crosses with the new gene produced only colored progeny. The new gene *al* inhibited the appearance of silver and gold as effectively as black. Albinos carrying the barring gene were evident by the down. By contrast, the unpigmented head spot was characteristic, as well as markings in the adult plumage which caused ghost barring. In matings of colored F₁ ♂s produced by albino ♂ and other fowl, there was an excess of 9 percent of albinos over the equal distribution of normal and albino ♀s expected. Viability of embryos after 5 days of incubation, when albinism could be determined, was equal to normals. Egg production, fertility of eggs, hatchability, and attainment of sexual maturity were also normal.

An analysis of feather color pattern produced by grafting melanophores during embryonic development, B. H. WILLER (*Amer. Nat.*, 75 (1941), No. 757, pp. 136-146, fig. 1).—The capacity to produce barring was shown to depend on the melanophores in the skin transplants between colored, barred, and white fowls. Reactions occurred between the physiological conditions provided by the genetic composition of the host and the melanophores of the donor. Hormone effects on the melanophore seemed most probable through the feather germ if account is taken that the threshold of action to hormones varies along the axes of the developing feather germ in the Brown Leghorn, as found by Lillie and Juhn (E. S. R., 81, p. 195).

The oxygen consumption of the early chick embryo at various stages of development, F. S. PHILLIPS (*Jour. Expt. Zool.*, 86 (1941), No. 2, pp. 257-289, figs. 7).—There was an increase of about 100 percent in the O₂ consumption of the chick blastoderm during the first 4 hr. of incubation. Glucose added to the Ringer-buffer medium in which the 3-day blastoderms were cultured prevented the decline of respiration rate occurring otherwise and caused an increase of about 60 to 70 percent in the O₂ consumption. With glucose the O₂ consumption of 3-day embryos was similar to that of many mammalian tissues, but the 3-day embryo probably represented the maximum size in vitro at which adequate O₂ can be received by all tissues.

Sex ratio in domestic chickens, F. A. HAYS. (Mass. Expt. Sta.). (*Amer. Nat.*, 75 (1941), No. 757, pp. 187-188).—A tendency for larger percentages of ♂s than ♀s was noted at 8 weeks of age among the March-hatched than among the April-hatched chicks in the high-fecundity line (51.24 and 50.31 percent, respectively).

The effect of an extra-chromosomal influence upon transplanted spontaneous tumors in mice, A. M. CLOUDMAN (*Science*, 93 (1941), No. 2416, pp. 380-381).—Mice developing from ova of a strain susceptible to one tumor but resistant to another were found to show indications of increased susceptibility to the second tumor if the progeny from fertilized ova were transferred to a ♀ of the susceptible strain. In one transfer in this manner there were 26 positive and 45 negative implants, and with the other tumor transplanted to zygotes from a resistant strain transferred to a ♀ from the line susceptible to the tumor there were 55 positive and 52 negative results. The influence of foster nursing was similarly tested in 21 fostered young, with positive results in 16 of them inoculated at 30 and 60 days of age.

The effect of foster nursing on the growth of a transmissible leukemia in mice, L. W. LAW (*Science*, 93 (1941), No. 2416, pp. 381-382).—Foster nursing was found to play a prominent role in susceptibility and resistance of strains of mice to leukemia. Leukemic cells, which grew in resistant fostered hosts, failed to grow in nonfostered animals.

Effects of sex and gonadotropic hormones on red cell counts of rats, E. P. VOLLMER, A. S. GORDON, I. LEVENSTEIN, and H. A. CHARIPPER (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 409-410).—Gonadal secretions are considered responsible for sex differences in the red cell counts of ♂ and ♀ rats. The red cell counts of normal ♂s and ♀s treated for 2 mo. with gonadin were 10.1 and 7.5 million, respectively, per cubic millimeter. Testosterone injections generally caused an increase and pregnant-mare serum a decrease in the erythrocytes.

Variations in bull semen and their relation to fertility, E. W. SWANSON and H. A. HERMAN. (Univ. Mo.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 321-331).—The results of examinations of 256 samples of semen collected from 10 bulls of the Jersey, Guernsey, and Holstein breeds are presented. Of the several properties observed the time of survival with vigorous motility in semen stored at 40° F. was most highly correlated with fertility. Semen pH, concentration, volume, percentage of abnormal spermatozoa, and initial motility were not generally correlated with fertility or time of survival with good motility. Among separate ejaculates from the same bull initial motility was roughly correlated with viability in storage. Semen properties showed great variability among ejaculates of different bulls as well as among those from the same bull. It is proposed that a bull's fertility should be rated on the basis of examinations of at least five semen samples collected over a period of not less than 2 weeks, and that the suitability for use or storage of the sample of semen from a fertile bull can best be determined at the time of collection by examination for motility.

Variations in dairy bull semen with respect to its use in artificial insemination, H. A. HERMAN and E. W. SWANSON (*Missouri Sta. Res. Bul.* 326 (1941), pp. 82, pt. 1, figs. 23).—Fertility for artificial insemination was maintained in good-quality bull semen stored for from 3 to 5 days in an undiluted condition at 40° F. The characteristics of the samples of 342 ejaculations of 55 dairy bulls were found to vary widely. These characteristics included volume, pH, morphology, and concentration of the sperm in the semen and the influence of storage in the natural state and after fluid removal or dilution. Initial motility and time of survival of good motility were found to serve as a good index of fertility. The pH for semen of normal fertility was close to 6.47, for questionable breeders 6.5, and for poor or sterile breeders 6.72 or above. Confirming the less complete report of Swanson and Herman, noted above, a single semen sample was not found sufficient to indicate the fertility of a

bull. Three or more were recommended. Centrifuging and dilution of the semen from eight bulls with a yolk-buffer, described by Phillips (E. S. R., 83, p. 615), gave a longer maintenance of a high rate of motility than occurred in untreated samples.

Relative metabolic rates of semen, seminal plasma, and bacteria in semen of the boar, C. F. WINCHESTER and F. F. MCKENZIE. (Mo. Expt. Sta. coop. U. S. D. A.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 455-458).—Seminal plasma of the boar consumed O_2 in amounts which varied from 5 to 22 percent of the O_2 consumption in the whole semen from which the plasma was obtained. The passage of CO_2 -free air over seminal plasma and into barium hydroxide yielded a white precipitate. However, the portion of the seminal plasma which passed through a porcelain filter failed to consume O_2 . Although there are usually bacteria in the semen from farm animals, these samples of plasma were free of bacteria. The respiratory quotient was unity.

On the role of sex hormones in sex differentiation in the opossum (*Didelphys virginiana*), C. R. MOORE (*Physiol. Zool.*, 14 (1941), No. 1, pp. 1-47, pls. 6).—The effects of ointments of androgens and oestrogens applied to opossum young from about 3 to 100 days in the pouch were studied histologically (E. S. R., 84, p. 317). The detailed results showed the hormones to have little effect on the development of the gonads, but zygotically different responses were apparent in the stimulation of the Müllerian and Wolffian ducts which were observed in both sexes.

The growth stimulating effect of small doses of testosterone propionate in the castrate albino rat, H. S. RUBINSTEIN and M. L. SOLOMON (*Endocrinology*, 28 (1941), No. 2, pp. 229-232, fig. 1).—Castrated rats treated with daily doses of 50 γ of testosterone propionate from 26 to 80 days of age gained 14.1 ± 5.2 gm. more than untreated controls.

The rate of absorption and effects of testosterone propionate pellets on mice, C. D. KOCHAKIAN (*Endocrinology*, 28 (1941), No. 3, pp. 478-484, figs. 4).—Pellets of testosterone implanted in castrated mice were found to stimulate growth in the prostate and seminal vesicles to more than twice the normal size. The rate of absorption was such that 11- and 22-mg. pellets would have been completely absorbed in from 80 to 90 and 120 to 130 days, respectively. The weights of various glands up to 96 days are given.

Androgenic action of desoxycorticosterone acetate? K. E. PASCHKIS (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 336-338).—In agreement with the findings of R. R. Greene and M. W. Burrill,² no androgenic activity of desoxycorticosterone acetate was induced in castrated rats or day-old chicks following subcutaneous injection. No stimulation in mitosis was noted in the prostates or seminal vesicles of rats even after colchicine was injected with the second dose.

The comparative androgenic potency of testosterone, methyl testosterone, and testosterone propionate administered in pellet form, G. R. BISKIND and M. A. MYER. (Univ. Calif.). (*Endocrinology*, 28 (1941), No. 2, pp. 217-221).—The androgenic effects of pellets of testosterone propionate, testosterone, and methyl testosterone implanted into mature and immature castrated δ rats were surprisingly uniform, as determined by the weights of the prostates and seminal vesicles at 5, 9, 13, and 17 days after the operation. The slow absorption from the pellets was thought to permit the others to approach testosterone propionate in activity.

² Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 2, pp. 382-384.

The effect of testosterone propionate on the rat testis, H. S. RUBINSTEIN and A. A. KURLAND (*Endocrinology*, 28 (1941), No. 3, pp. 495-505, figs. 5).—Doses of testosterone propionate varying from 5 γ to 2.5 mg. per day for from 10 to 54 days injected into ♂ rats from 22 to 32 days of age were found to have somewhat variable effects. These were best explained, in general, on the assumption that small doses stimulate proliferation of the germinal epithelium, but increased doses depress the pituitary gland, which, in turn, inhibits testicular growth and spermatogenesis. Thus, degeneration follows excessive doses.

Inhibition and stimulation of testes in rats treated with testosterone propionate, H. SHAY, J. GERSHON-COHEN, K. E. PASCHKIS, and S. S. FELS (*Endocrinology*, 28 (1941), No. 3, pp. 485-494, figs. 11).—Injection of rats with 1 mg. of testosterone propionate three times weekly from the first day of life caused decreases of from 64 to 90 percent in the weights of the testicles between 60 and 196 days of life, and there was marked arrest of maturation of spermatozoa. However, 5 mg. of the hormone administered six times weekly for 30 days caused increases of from 28 to 219 percent in the weight of the testicles as compared with the controls. Continuing the treatment for 60 days resulted in changes in the testicle weights from +13 to -80 percent. This treatment between the thirtieth and sixtieth days of age resulted in increased testicle weight from 1 to 61 percent. As a tentative explanation, the testosterone propionate is thought to stimulate the testes directly and, at the same time, to inhibit the pituitary, which is more sensitive.

Androsterone effect on pituitary and mammary gland, R. P. REECE. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 265-266).—Two oestrogens and one androgen increased the lactogen content of the rat pituitary and induced mammary growth (E. S. R., 81, p. 773). Daily doses of 200 γ did not cause significant increases in the pituitary weights or lactogen in the pituitaries after 15 days in spayed ♀ rats, and there was no detectable growth in the mammary glands, as compared with 15 untreated control rats. Pigeon crop tests served for assaying the lactogen.

Blood serum and skeletal changes in two breeds of ducks receiving estrogens, W. LANDAUER, C. A. PFEIFFER, W. U. GARDNER, and J. C. SHAW. (Univ. Conn. et al.). (*Endocrinology*, 28 (1941), No. 3, pp. 458-464).—As there was suggestion of a relation between egg production and serum Ca and lipides in the fowl (E. S. R., 81, p. 637), the authors studied changes in ♂ Pekin and Mallard ducks to avoid variations that might be associated with reproductive activity. Birds treated and untreated with from 0.34 to 2 mg. of oestradiol benzoate daily were employed in the study. Following the injection of oestrogens, the serum Ca of both breeds increased markedly, with the increases somewhat lower in Mallards than in Pekins. The increased doses caused a pronounced decrease in the weights of the testes of Mallards, without material change in the Pekins. The latter breed exhibited more extreme changes in serum Ca and bone formation with increased doses than the Mallards. Both breeds showed marked rise in the serum fat, but there were differences in the breed responses to heavier oestrogen administration. Parathyroid extracts did not appear to play a decisive role in causing changes which result from oestrogen treatment.

Effects of estrogen and progesterone upon the genital tract of the ewe, T. D. BELL, L. E. CASIDA, and A. E. DARLOW. (Wis. Expt. Sta.). (*Endocrinology*, 28 (1941), No. 3, pp. 441-449, fig. 1).—Carrying further studies of the effects of oestrogens on the reproductive tract of spayed ewes previously reported by McKenzie and Terrill (E. S. R., 78, p. 32), the authors induced heat within

from 1 to 2 days and increased the heights of the vaginal and uterine epithelium by injection of 1,000 rat units of oestradiol benzoate in spayed yearling ewes. When eight daily doses of progesterone were given, beginning 4 days after the oestradiol, there was a tendency to maintain the increased height of the epithelium. The progesterone also caused an increased coiling of the uterine and cervical glands, with regression relatively slow at the higher levels of progesterone. There was a thicker, more darkly staining mucus in the cervical sections. The experiment was based on 30 spayed yearling ewes.

Qualitative progesterone assay of pregnant cattle AP and extracts having mammary growth activity, J. J. TRENTIN, J. P. MIXNER, A. A. LEWIS, and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 440-443).—Neither the mammogenic nor the lobule-alveolar effect of the pituitary was due to the presence of progesterone. Water suspensions and lipid extracts of cattle pituitaries in amounts sufficient to stimulate growth of the lobule-alveolar system in ♀ mice contained insufficient progesterone to give a positive response by the McGinty technic (E. S. R., 82, p. 759) with rabbits. However, positive responses were obtained in rabbits with 0.02 and 0.0002 mg. of crystalline progesterone.

The effect of long term stimulation of male and female rats with estrone, estradiol benzoate, and testosterone propionate administered in pellet form, J. MARK and G. R. BISKIND (*Endocrinology*, 28 (1941), No. 3, pp. 465-477, figs. 3).—The absorption and effects of pellets of estrone, estradiol benzoate, and testosterone propionate implanted in different locations in normal and castrated ♀ and ♂ rats by methods of Deanesly and Parkes (E. S. R., 79, p. 38) are described. In some cases the implantations remained as long as 237 days. Details on the responses and body, gland, and organ weights are presented. The oestrogens produced cornified smears for long periods in intact birds, and one oestrogen pellet produced continuous cornification from 154 to 230 days in castrated ♀s. Decreases in ovarian, uterine, adrenal, and hypophyseal weights and inhibition of ovarian cycles followed testosterone implants in adult ♀s. Oestradiol and testosterone propionate in ♂s resulted in testicular atrophy. The rates of pellet absorption were calculated.

Synergism of the follicle stimulating and luteinizing hormones in producing estrogen secretion, H. L. FEVOLD (*Endocrinology*, 28 (1941), No. 1, pp. 33-36).—Although luteinizing hormone alone was unable to stimulate the ovaries to secrete oestrogens and follicle-stimulating hormone alone was relatively inefficient, there was a marked stimulation in uterine growth in immature ♀s when the two hormones were injected separately in the same animal. There was thus a synergistic action between these two hormones in causing uterine growth in immature normal and hypophysectomized ♀ rats, presumably through action on the developing follicles. A small dose of luteinizing hormone, 0.0008 mg., with 0.012 mg. of follicle-stimulating hormone was sufficient for a 90-percent increase in the uterine weight.

Fractionation study of the residual ovary, J. L. SEALEY and H. W. MARLOW (*Endocrinology*, 28 (1941), No. 3, pp. 431-435).—Although several fractions of the ovaries freed of the follicular hormone were tested, only those which contained oestriol and estrone had any oestrogenic activity in castrated young ♀ rats.

Rhythms of ovogenesis before sexual maturity in the rat and cat, M. E. SNEIDER (*Amer. Jour. Anat.*, 67 (1940), No. 3, pp. 471-499, pls. 4).—From birth to sexual maturity, ova of the rat and cat are subject to degeneration, followed by continual and rhythmical formation of new oocytes from the germinal epi-

thelium. Histological studies were made of ovaries from 76 rats ranging in age from 2 hr. to 77 days and 43 kitten ovaries from 22 hr. to 120 days.

The response of inbred mice to oestrone, C. W. EMMENS (*Jour. Endocrinol.*, 1 (1939), No. 4, pp. 373-377).—The greater variation in response to different doses of oestrone by ♀ mice inbred by brother and sister matings for 39 generations than by random-bred mice led to the conclusion that the factors causing these variations are not likely to be due to differences in the genetic constitution of the strains.

Contributions to research on the female sex hormones: The implantation of the mouse egg, S. BLOCH (*Jour. Endocrinol.*, 1 (1939), No. 4, pp. 399-408, pls. 3).—The corpus luteum of pregnancy was considered responsible for the activity of the endometrium in implantation as a result of histological study of transverse sections through large numbers of uteri of mice containing blastocysts ready for implantation. These studies showed the epithelium in most active secretion before implantation, and after implantation the secretion was absorbed by the blastocysts. The injection of synthetic corpus luteum hormone provoked the secretion in the uterine horn even in the absence of blastocysts. Considering the two sides of the uterus, secretion was greater on the anti-mesometrial side, resulting in the suggestion that the areas of strong secretion are chemotactically attracting the blastocysts, thus causing their implantation in these places.

Fate of ovaries which have been grafted in the ear for long periods of time, R. T. HILL (*Endocrinology*, 23 (1941), No. 3, pp. 426-430, figs. 6).—Histological studies of ovaries which had been grafted in the ears of castrated ♂ mice for over 305 days did not give any suggestion as to the androgenic production (E. S. R., 80, p. 608) of different types of tissue. There was no suggestion of a change in the histology of the thyroid, seminal vesicles, or ovarian tissue in the grafts to suggest the source of the androgen which caused the presence of normal prostates and seminal vesicles.

The control of ovum growth, G. PINCUS (*Science*, 93 (1941), No. 2419, pp. 438-439).—Vitamin B₁ and sulphydryl compounds acted as stimulants to rabbit ovum growth in vitro. Low concentrations of several poisons inhibited growth, whereas several putative substrates and riboflavin were ineffective. Limitation of growth under anaerobic conditions appeared to involve the metabolism of pyruvic acid.

Relation of nutrition to mammary growth after estradiol administration to hypophysectomized rats, L. T. SAMUELS, R. M. REINECKE, and W. E. PETERSEN. (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 379-382, fig. 1).—Well-nourished hypophysectomized virgin rats which were given large doses of oestradiol benzoate for 28 days did not show mammary development, although the gland was markedly stimulated in normal litter-mate controls similarly treated. These results with six hypophysectomized and three litter-mate controls are considered to support the hypothesis of Lewis and Turner (E. S. R., 82, p. 758) that oestrogens affect the mammary gland only through stimulation of the pituitary to produce the duct growth and alveolar factors. The deleterious effects of undernutrition of hypophysectomized animals on mammary development, reported by Astwood et al. (E. S. R., 78, p. 320), were avoided by feeding the operated animals with a stomach tube.

Effect of pro-oxidants upon reproduction in rats, F. E. DEATHERAGE, K. P. MCCONNELL, and H. A. MATTILL (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 399-402).—The process of reproduction in about 75 ♀ rats on adequate diets was not interfered with by the oral, subcutaneous, or intraperitoneal administration of various fat oxidants for long periods or by mixing ethereal

ferric chloride with the feed, although mortality of the young was heavy and some of the ♀s died as a result of the toxic action rather than from vitamin E oxidation.

Influence of local applications of turpentine on mammary gland growth and involution, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 437-440).—The application of spirits of turpentine to the nipples and surrounding skin of normal and castrate ♀ mice caused a retardation in the rate of involution of the mammary alveolar system of ♀s from which the young were removed. Although the retardation was noted in 7 days, treatment with the turpentine failed to stimulate growth of the alveoli in castrate animals.

Growth and development of six generations of thymectomized albino rats, A. SEGALOFF and W. O. NELSON (*Amer. Jour. Physiol.*, 130 (1940), No. 4, pp. 671-674, fig. 1).—Thymectomy at 21 days in six successive generations of rats had no significant effects on the body growth, reproductive history, or the size of the organs measured at 70 days of age in each generation.

Dependence of seasonal periodicity in gonadal changes on the thyroid gland in *Sturnus vulgaris* L., A. A. WOITKEWITSCH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 7, pp. 741-745, figs. 2).—Thyroidectomized starlings were found to retain the yellow color of the bill indicative of high sexual activity. In the spring the measurements and weights of the testes of thyroidectomized birds were practically the same as normal controls, but in the quiescent period the size and weight of the gonads exceeded those of normals. The thyroidectomized birds did not exhibit the seasonal variations in gonad size common to normal controls. Unless castrated, the thyroidectomized birds exhibited the bill color characteristic of normal birds in the breeding season. The disturbance of periodicity is attributed to changes in hypophyseal activity and the lack of effects of the thyroid on the gonads.

Effect of pituitary growth hormone on the thymectomized rat, W. O. REINEHARDT, W. MARX, and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 411-415).—Evidence regarding the growth of thymectomized and hypophysectomized rats as a result of injection of growth hormone from the pituitary did not support the claim that the thymus contains substances with growth-promoting properties. In two experiments, ♀ rats thymectomized at from 8 to 9 days of age gave essentially the same response in growth to hypophysectomy and the administration of growth-promoting hormone of the pituitary as rats in which the thymus was allowed to remain.

Sex differences in the activity of gonads in thyroidectomized fowl, A. A. WOITKEWITSCH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 7, pp. 738-740, fig. 1).—In studies of the effects of thyroidectomy it was found that the testes were reduced from above 1,500 to less than 600 mg., and no spermatogenesis was found. The comb and wattles changed little in size, but they lost much of their high color. Thyroidectomized ♀s laid as many eggs as the control birds, but the experimental birds were conspicuous because of the anemic, diminutive combs. By thyroid therapy thyroidectomized birds were largely returned to normal in comb appearance and reproduction, but the prolonged reproductive condition could be maintained only in the presence of additional thyroid material.

The results of adrenalectomy in the pregnant albino rat, T. McKEOWN and W. R. SPURRELL (*Jour. Physiol.*, 98 (1940), No. 2, pp. 255-262).—The survival period of ♀ rats adrenalectomized during pregnancy exceeded that of nonpregnant ♀s so treated. Evidently this result was not due to activity of the fetal adrenals, since similar results were obtained when the fetuses were also removed. The corpus luteum is considered responsible.

The effect of adrenalectomy on pregnancy and survival of untreated and sesame oil treated rats, C. E. TOBIN (*Endocrinology*, 28 (1941), No. 3, pp. 419-425).—Normal gestation and parturition were found possible in the adrenalectomized rat, especially when adrenalectomy was performed in the pregnant animal. However, the placento-fetal complex alone was not sufficient to maintain pregnancy in the absence of the ovary. Since the views on this subject by McKeown and Spurrell, noted above, are somewhat at variance, study was made of the possibilities of influences of adrenalectomy before breeding and at the second and the seventeenth to nineteenth days of gestation. The average survival time of those that did not become pregnant was 11.5 ± 0.9 days. Those that became pregnant just after adrenalectomy, whether or not the fetuses were resorbed, survived 18.6 ± 2.4 days. All pregnant ♀s survived longer than those not pregnant. Daily injection with 0.25 or 0.5 cc. of sesame oil not only increased the survival but also the number of pregnancies about 10 percent. The survival from pregnancy alone in the absence of ovaries was not sufficient to maintain gestation in adrenalectomized ♀s.

FIELD CROPS

[Agronomic research in Kansas] (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 69-73, 99-117, 155-171, pls. 2, figs. 7).—Papers of interest to agronomists include Soil Moisture and Winter Wheat in Kansas, by H. E. Myers (*Kans. Expt. Sta.*), and Recent Migrational Trends in the Distribution of Weeds in Kansas, by F. C. Gates, and A Study of the Variations in the Growth of Blue Grama Grass From Seed Produced in Various Sections of the Great Plains Region, by A. Riegel (both *Kans. State Col.*).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 12, pp. 1, 2, fig. 1; 4 (1941), Nos. 1, pp. 1, 2, 3-4, 6, 7, 8; 2, pp. 1, 2, 3-5, 5-6, 6-7, 8).—Reports of progress are made from current agronomic investigations in the following articles:

No. 12.—New Legume [Alyce Clover] Not Superior to Lespedeza, by H. W. Bennett (p. 1); and Hybrids Compared With Adapted Varieties of Corn in Test at Seven Stations, by C. R. Owen (pp. 1, 2).

No. 1.—Cotton Tests at 4 Stations During 1940 (pp. 1, 2); Varieties and Yields of Familiar and New Crops (p. 3), Fertilizer, Legumes, for Better Crops (p. 3), Preparation, Erosion, Cultivation (pp. 3-4), Irish Potatoes (p. 6), and Sweetpotato Varieties, Culture, Fertilization (p. 6), all by C. Dorman; Tennessee Hybrids Lead in Tests of Corn Conducted 3 Years at Stoneville—Lead Over Adapted Varieties Not Considerable, by P. W. Gull (p. 7); and More Cotton Per Acre From 4 Tons of Stable Manure Than From Any Amount Fertilizer—8-Year Results, Poplarville, by J. C. Robert (p. 8).

No. 2.—Early Planting of Lespedeza, First Secret of Success, by H. W. Bennett (p. 1); Fertilizers and Legumes for Increased Yields of Cotton and Corn in Delta and Hill Sections, by R. Kuykendall, E. B. Ferris, and R. Coleman (p. 2); Commercial Nitrogen Plus Winter Legumes Turned Under (p. 2), Commercial Nitrogen for Cotton at Rate of 30 Pounds Per Acre, Preferable Rate in Delta Test—Spring Applications Yield Best (p. 7), and Cotton Fertilizer Measured in Delta Experiment (p. 8), all by R. Kuykendall; Increased Corn Yields Go With Use of Nitrogen, by R. Coleman (p. 7); and Top-Dressing With Nitrogen Increases Oat Yield, 8 Tests, by J. Pitner (p. 8). This number also includes brief reports by C. Dorman on tests of fertilizers and winter legumes for cotton and corn, of fertilizers on pasture, and of miscellaneous hay crops at Holly Springs; pasture experiments at Natchez; fertilizer tests with

cotton, corn, and oats, winter legumes for soil improvement, variety tests with cotton, corn (and hybrids), wheat, oats, barley, soybeans and edible soybeans, potatoes, and sweetpotatoes, breeding work with cotton and soybeans, and cultural tests with cotton and sweetpotatoes, all at the Delta Substation; tests of winter and summer legumes for cotton and corn and crop rotations at the Raymond Substation; and fertilizer tests with cotton and sugarcane, injurious effects of calcium arsenate on soils, and a hemp production test, all at Poplarville.

Ecological relationships of playa lakes in the southern Great Plains, J. M. PARKER and C. J. WHITFIELD. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 125-129, figs. 2).—Contour tillage and terracing of cultivated lands around large playa lakes, according to observations and surveys near the Amarillo (Tex.) Experiment Station, appeared to be of value in holding the moisture where it falls, keeping it out of the lakes, and also giving buffalo grass, the most important perennial grass, a chance to spread. Other outstanding species were false ragweed (*Franseria tomentosa*), spikerush (*Eleocharis palustris*), and snow-on-the-mountain (*Euphorbia marginata*). Other grasses and forbs are listed.

The grasslands of the Argentine and Patagonia, W. DAVIES (*Imp. Bur. Pastures and Forage Crops* [*Abcrystwyth*], *Herb. Pub. Ser. Bul.* 30 (1940), pp. 46+[4], pls. 6, fig. 1).—The characteristics of the several types of grasslands in Argentina are described, with comments on the livestock industry dependent upon such grasslands, a glossary of common plant names and an index of species, and a grassland map of the Republic.

Pasture plants and pastures of New Zealand, F. W. HILGENDORF (*Auckland and London: Whitcombe & Tombs*, [1939], 5. ed., pp. 94, figs. 30).—A revision of the book noted earlier (*El. S. R.*, 45, p. 127).

Effect of soil treatment and grazing management on the productivity, erosion, and run-off from pasture land, C. A. VAN DOREN, W. L. BURLISON, L. E. GARD, and R. F. FUELEMAN. (*Ill. Expt. Sta. and U. S. D. A.*). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 877-887, figs. 3).—The effects of moderate and intense grazing and of limestone and phosphorus in combination as against no treatment on forage values, water retention, and erosion resistance of an uncultivated plant cover were studied at Dixon Springs, Ill., 1938 and 1939. Pasture seeds mixtures were sown in fall and spring. The vegetative cover on treated land on which regulated grazing was practiced was from three to four times greater than on land grazed intensively, but regulation of grazing did not markedly increase the cover on untreated land. Severe grazing and lack of soil treatment increased the proportion of undesirable vegetation. Soil losses from land with established vegetal cover were slight, even under severe grazing and low fertility conditions. Annual weedy grasses abundant on untreated land under intensive grazing protected the soil against erosion. Run-off losses from intensively grazed land treated with limestone and phosphorus exceeded those from land similarly treated but grazed moderately. Grazing management did not significantly affect run-off losses on untreated plots. Under moderate grazing run-off losses from untreated land were greater than from treated land, but losses were not greater under severe grazing, results being influenced by the type of weed growth on untreated land. Number of pasture days of grazing with sheep were about the same on treated land under the two intensities of grazing, while on untreated land fewer days of grazing were obtained under moderate than severe grazing. Yearling ewes gained considerably more during the grazing season on treated land with regulated than with severe grazing.

A short cut method of computing grazing capacity ratings from range survey forage estimates, F. B. HARRIS (*Nevada Sta. Bul. 155 (1941), pp. 15, figs. 6*).—The short-cut method of computing carrying capacity ratings, which has many distinct advantages over those in use at present, is directly applicable to the point observation plat and ocular reconnaissance methods of range survey, and involves no changes in field procedure. The method described greatly reduces the time needed to compute carrying capacity rating (surface acres per animal unit month) from estimates of forage density. This is accomplished by prearrangement of the coded products of density times proper use factor (forage factors) on the write-up sheet. The sum of these small whole numbers is converted to surface acres per animal unit month by reference to tables which form part of the sheet.

Growth substances on turf grasses, J. F. CORNMAN and J. W. BENGTSON (*Turf Cult., 2 (1940), No. 2, pp. 110-120, fig. 1*).—From the results of tests in which stolons, seed, and turf of various grasses were treated with numerous preparations of different types of growth substances, there is believed to be little or no likelihood of helping grass in a practical way with any of those now available.

Effect of seed treatment on stands of some forage legumes, S. J. P. CHILTON and R. J. GABBER. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 33 (1941), No. 1, pp. 75-83, fig. 1*).—When seed of different species of *Lespedeza*, *Lotus*, *Medicago*, *Melilotus*, and *Trifolium* was subjected to treatment with five fungicides to determine their relative efficiency in controlling damping-off, highly significant increases in stand were obtained with certain fungicides with certain species. Others did not respond to the several treatments, and injury resulted in some cases. The results presented suggested that seed treatment of small-seeded legumes may be helpful in increasing stands. Recommendations await further tests under field conditions and with various soil types.

Soil organic matter and nitrogen as influenced by green manure crop management on Norfolk coarse sand, N. McKAIG, JR., W. A. CARNS, and A. B. BOWEN. (U. S. D. A. and S. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 11, pp. 842-852, figs. 5*).—Soybeans and velvetbeans as green manures in field plats in a 3-yr. rotation of legumes, corn, and cotton were generally similar in effects on the carbon and nitrogen content of Norfolk coarse sand near Columbia, S. C. The soil of the cowpea plats was a little lower in nitrogen and had a higher carbon:nitrogen ratio. When the entire legume, fertilized with a 2-percent nitrogen mixture, was plowed under, soil carbon and nitrogen were lower than when the legume stubble grown with a 6-percent nitrogen mixture was turned. A summer green manure followed by a winter cover crop of rye maintained soil carbon and nitrogen at a higher level than a summer cover crop with winter fallow management. Cotton and corn yields were improved after legume green manures in summer followed by winter rye. When *Crotalaria striata* and cowpeas, with and without a rye winter cover, were grown 2 yr. in lysimeters and followed by pearl millet without a winter cover crop for 3 yr., a marked increase in soil carbon and nitrogen occurred in *crotalaria* tanks after they were planted to pearl millet. Pearl millet yields were greater after *crotalaria* than after cowpeas and were greater after a winter cover of rye than with winter fallow. Maximum benefits of green manuring evidently are obtained by storing organic matter during the soil improvement period and then releasing its contained nutrients by decomposition when they are of most benefit to the next crop. On porous soils, winter cover crops hold the nutrients released by the decomposition of a summer green manure until used by the next season's crop.

Field germination of alfalfa seed submitted for registration in Colorado and varying in hard seed content, R. M. WEIHING. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, pp. 944-949).—Samples of alfalfa seed with from 20 to 62 percent of hard seeds produced about equal numbers of plants in the field and averaged from 57 to 60 percent germination. Samples with fewer than 20 percent of hard seeds averaged from 61 to 64 percent germination and emergence was more rapid, but from 2 to 3 weeks after planting all samples had nearly equal numbers of plants. Under favorable field conditions evidently not more than 70 percent emergence may be expected for samples of seed germinating nearly 100 percent in the laboratory. Alfalfa seed containing many hard seeds had about the same agricultural value for planting as that with few hard seeds.

Storing alfalfa seedlings, C. O. GRANDFIELD. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, p. 972).—Alfalfa seedlings were stored at 40°-42° and 32°-34° F. for from 1 to 5 mo. without material loss of plants. Stored plants started growth quicker and were in bloom from 4 to 5 days earlier than those transplanted directly from the greenhouse.

Forage yields of five varieties of alfalfa grown in nursery rows and field plots, R. M. WEIHING and D. W. ROBERTSON. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 156-163, fig. 1).—The yields of Meeker Baltic, Nebraska Common, Grimm, Ladak, and Hardistan alfalfas from several types of nursery plats at the station, 1938-39, were compared with yields from $\frac{1}{2}$ -acre field plats. All varieties were five-replicated in Latin square designs. Yields were calculated in tons per acre of oven-dry hay. The five varieties yielded relatively the same in the field plats and in the following types of nursery plats: Single-row plats 3 ft. apart; three-row plats, 20 in. between rows, 20-in. alleys, using the middle row and all three rows; and five-row plats, 12 in. between rows, 20-in. alleys, using three rows and all five rows. Any of the following types of nursery plats was indicated for precise testing under irrigation: Single-row plats 3 ft. apart; three-row plats, 20 in. between rows, 20-in. alleys; and five-row plats, 12 in. between rows, 20-in. alleys. These types do not require more replications than the field plats. It is suggested that the entire plat be harvested for yield, since border effect and interplat competition did not noticeably affect comparability of yields between these nursery plats and field plats.

Cutting treatments as an aid in the appraisal of varieties of alfalfa, D. SMITH and L. F. GRABER. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 142-152).—Significant differences in field responses of varieties and strains of alfalfa with varying degrees of winter hardiness and tolerance to bacterial wilt disease, according to data presented, may not appear for from 5 to 6 yr. when given a standard cutting treatment. Cutting schedules including spring clippings were detrimental to survival and forage production and hastened and amplified differences in these major agronomic characteristics of wilt-tolerant and wilt-susceptible varieties. Apart from cutting treatments, which may be standard for a given locality or region, other cutting schedules designed specifically to augment responses to bacterial wilt disease and to winter losses may prove useful in appraising new varieties and strains.

Recovery after cutting and differentials in the injury of alfalfa by leafhoppers (*Empoasca fabae*), L. F. GRABER. (Univ. Wis.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 181-183).—An unusual differential in leafhopper injury to alfalfa occurred in a varietal trial at Madison, Wis., in 1940. Second growth was injured severely by leafhoppers in fairly sharply defined areas, while larger and contiguous areas under the same cutting treatment were practically free from such damage. Such differentials were not associated directly with the varieties or strains included in this trial. Adult leafhoppers surviving

the first cutting appeared to express a definite preference for egg deposition in alfalfa of areas where recovery of second growth was more rapid and succulent due to larger supplies of subsoil moisture. Details of this observation were reported because of possible significance in interpreting causes of uncommon differentials in leafhopper injury of second growth of alfalfa, and because of implications in evaluating strains and varieties for such qualities as resistance to or escape from such insect injury.

Soaking buffalo grass (*Buchloe dactyloides*) seed to improve its germination. L. E. WENGER. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 135-141, fig. 1).—Soaking buffalo grass seed in water from 2 to 4 days followed by immediate and thorough drying appeared practical as a preseeding treatment in overcoming delayed germination and dormancy. In general, the older the seed and the longer it has been weathered, the shorter should be the soaking period. Two-year-old seed so treated gave an average field germination of 33 percent under adverse conditions and untreated seed 14.2 percent, while under optimum conditions the respective treatments gave average field germinations of 43.6 and 7 percent. In laboratory tests by A. F. Musil the same seed from 2-, 3-, and 4-day treatments gave an average bur germination of 59.5 and 80 percent by the water and potassium nitrate treatments, respectively, and untreated seed 8.6 and 33 percent. On a caryopsis basis germination averaged 37.6 and 51.4 percent as compared to 3.5 and 15.7 percent for untreated seed. Emergence of treated seed was decidedly more prompt and uniform; in most cases, quick uniform germination appeared decidedly advantageous in establishing stands. Prechilling seed dry, treated or untreated, for 6 weeks at 5° C. gave a significant increase in germination. An earlier test determined that soaked buffalo grass seed would retain viability very well for at least 2 yr. after soaking.

Hybrid corn adaptation trials in Wyoming, 1940. W. A. RIEDL and W. L. QUAYLE (*Wyoming Sta. Bul.* 246 (1941), pp. 20, figs. 4).—Results in 1940, together with those of 1939 (*El. S. R.*, 83, p. 334), show that on irrigated land at altitudes of from 4,000 to 6,000 ft., large increases in yield of shelled corn, green forage, and dry forage may be obtained from use of adapted hybrids. The best hybrids at Torrington and Thermopolis gave increases of from 35 to 45 percent in grain and from 40 to 60 percent in forage yields over standard local varieties. Under irrigation at Laramie, 7,200 ft. altitude, several hybrids were earlier than the earliest standard variety but did not exceed it in grain yield. Several hybrids made larger yields of forage, increases of 50 percent being obtained. Most of the hybrids tested on dry land gave higher yields of forage than local varieties, but due to subnormal rainfall during the growing season the grain yield was too low to determine the relative adaptabilities.

The lithium method of measuring the extent of corn root systems. J. D. SAYRE and V. H. MORRIS. (Ohio Expt. Sta. and U. S. D. A.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 761-764).—Placement of small quantities of lithium chloride (2 gm. per 1,000 gm. of soil) in the soil at marked locations between corn rows and spectrographic tests of the tissues of the corn nodes made it possible to estimate the extent of the root systems. According to results, 1933-36, all plants 40 cm. (15.75 in.) from the Li spot contained Li, showing that the roots had penetrated to the Li core; while none as far away as 110 cm. contained Li. Since half of the plants showed positive tests at from 60 to 69 cm., the average root extension, as determined by this method, was about 2 ft. from the plant.

The use of tensiometers for following soil moisture conditions under corn. M. B. RUSSELL, F. E. DAVIS, and R. A. BAIR. (Iowa Expt. Sta. coop. U. S.

D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 12, pp. 922-930, figs. 5).—Soil moisture conditions under corn were followed successfully during 1938 and 1939 by tensiometers installed at depths ranging to 60 in. at several locations in 2-acre fields. Corn roots first absorbed moisture at a shallow depth directly beneath corn hills. The absorbing zone extended laterally until most of the available moisture at that depth was depleted, and then such lateral expansion occurred at successively lower depths as the growing season progressed. Data from cups installed equidistant between four adjacent corn hills were the most reliable for making year to year comparisons.

Storage tests with seed corn, J. D. SAYRE. (Ohio Expt. Sta. and U. S. D. A.). (*Ohio Jour. Sci.*, 40 (1940), No. 4, pp. 181-185).—Kernels of Clarage corn, sealed in glass tubes and containing 18 percent moisture, remained viable after 6 yr. when stored at temperatures below freezing but died in less than 6 mo. at room temperature (about 30° C.). When stored at about 30°, kernels stored in O died in 3 yr. and in N or CO₂ decreased noticeably in germination, whereas those stored at low temperatures in these gases or air gave good germination after 5 yr.

The influence on cotton production of nitrogen, phosphorus, and potassium and their combination, J. L. ANTHONY and J. PITNER (*Mississippi Sta. Bul.* 357 (1941), pp. 15).—Fertilizer tests with cotton during 6 yr. in cooperation with farms and substations involved 400-lb. per acre rates of the 4-8-4, 0-8-4, 4-8-0, and 4-0-4 combinations on different soil types in the hill sections of Mississippi. Most, although not all, soils of sandy texture appeared to need N, P, and K for maximum economical cotton production. Soils of silt or clay texture were found to vary widely in response to combinations of fertilizers, some requiring NPK and others PK or NK for best results. Costs of fertilizer treatments and estimated profits per acre are given for each experiment. Since such wide differences exist among soils and even between soils on any one farm, all fertilizer recommendations are deemed of a general nature and must be adapted by the farmer to his own requirements and conditions. Simple field tests are outlined for farmers desiring to determine their specific fertilizer needs.

Evidence of the value of the sodium ion in cotton fertilizers, E. D. MATTHEWS (*Georgia Sta. Cir.* 127 (1941), p. 7).—In fertilizer experiments with cotton, 1939-40, the crop receiving 600 lb. per acre of 5-10-5 fertilizer including N one-half as sodium nitrate and one-half as ammonium sulfate averaged 945 lb. of seed cotton per acre and that receiving N as ammonium nitrate 890 lb., the difference seeming due to the Na ion. Other studies showed that Na is of distinct value to cotton on soils which respond to potash fertilization, as Clarksville gravelly silt loam, but of no benefit on soils plentifully supplied with potash, as Decatur clay loam. Benefits from Na, where they exist, may be about 40 percent as much as benefits from equivalent amounts of K.

Uton, a new high-yielding white oat resistant to loose and covered smuts, D. C. TINGEX, R. W. WOODWARD, and T. R. STANTON. (Coop. U. S. D. A.). (*Utah Sta. Bul.* 296 (1941), pp. 15, fig. 1).—Uton, a new oats variety with a large white kernel and resistant to both loose and covered smuts, was selected from Markton × Swedish Select. It has yielded somewhat higher than either parent in tests throughout the State, but differs little therefrom in date of heading or ripening, bushel weight, or lodging resistance. It is recommended to replace both of these varieties. Statistics on production of oats and other small grains in Utah are included.

Differences in plant type and reaction to rust among several collections of *Panicum virgatum* L., D. R. CORNELIUS and C. O. JOHNSTON. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 2, pp. 115-124,

figs. 2).—Switchgrass accessions from different parts of the Great Plains were tested in the U. S. D. A. Soil Conservation Service nursery at Manhattan, Kans., where they were subjected to heavy natural infection by rust (*Uromyces graminicola*). Characters determining usefulness for forage production and erosion control, and for resistance to rust, varied considerably. Collections from O'Neill, Nebr., and from North Dakota were short, early-maturing, low in forage yield and seed production, and extremely susceptible to rust, while those from lowland in Oklahoma and from southern Texas were tall, coarse, late, and highly rust-resistant. Kansas collections were intermediate in type and rust reaction, those from western Kansas being lower, earlier, and less leafy than accessions from eastern Kansas. G208, a selection from Blackwell, Okla., had more desirable characteristics than any other accession; it was leafy, fine-stemmed, late, high in seed production, and promising in rust resistance.

Investigation of rest period in plants in connexion with changes in water regime, Z. P. BULGAKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 9, pp. 1045-1047*).—According to the literature and experiments by the author, the sprouting of old potato tubers is closely connected with their water content. Whereas in young tubers a loss of 20 percent of the initial content was required for sprouting, in old tubers a loss of from 3 to 4 percent proved sufficient. Old tubers which had lost from 5 to 6 percent of their initial water content sprouted only after they had been placed in moist sand.

A roguing service for producers of foundation seed potatoes, G. W. SIMPSON (*Maine Sta. Misc. Pub. 564 (1941), pp. [16]*).—The publication is similar in scope to that previously noted (*E. S. R., 85, p. 46*).

Sugar-beet culture under irrigation in the northern Great Plains, S. B. NUCKOLS. (Coop. Wyo. Expt. Sta. et al.). (*U. S. Dept. Agr., Farmers' Bul. 1867 (1941), pp. [2]+58, figs. 22*).—The sugar beet practices found successful in the northern portion of the Great Plains region and here outlined are based on experimental work conducted chiefly in irrigated districts of Nebraska, South Dakota, and Wyoming, but with allowance for local differences in conditions also apply to other areas where sugar beets are grown under irrigation. Information is presented on climatic influences; land selection; crop rotation (*E. S. R., 72, p. 759; 75, p. 617; 78, p. 36*); use of livestock manures, green manures, and commercial fertilizers; seedbed preparation; seeding; soil-crust control; hand blocking and thinning and mechanical blocking and cross-cultivation; hoeing; cultivation; irrigation; harvesting; sucrose percentage; and sugar beet byproducts (*E. S. R., 71, p. 79*).

Sweetpotato plant spacing, W. S. ANDERSON, E. A. CURREY, E. B. FERRIS, and J. C. ROBERT (*Mississippi Sta. Bul. 358 (1941), pp. 19*).—Results of spacing experiments, 1938-40, with the Porto Rico table variety of sweetpotato suggested that with the fertilizer treatments recommended for the several regions of the State and planting May 15 to June 15, plants should be spaced about 12 in. apart in rows from 3 to 4 ft. wide. Earlier plantings may be spaced wider if the grower can use oversize potatoes. Later plantings may be spaced as close as 3 in. Tests with Triumph grown for starch in the Laurel area show that spacings from 12 to 18 in. are equally profitable, although local factors, including plant supply and planting facilities, may be important in determining the best spacing for starch production, dehydration, or for stock feed. In the associated fertilizer studies, the 1,000- and 1,500-lb. applications were only slightly, if any, more profitable than 500 lb. of 6-8-4 or 4-8-4 fertilizer.

Time and rate of plant nutrient absorption by bright tobacco, H. R. DAVIES and A. L. GRIZZARD. (Va. Expt. Sta.). (Va. Acad. Sci. Proc., 1940, pp. 207-208).—An abstract.

Time factor in phosphate nutrition of spring wheats, S. OVECHKIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 2, p. 170-174*).—Experiments are summarized showing the relation of time of application of phosphate to spike development and yield of grain.

Carbohydrate metabolism and winter hardiness of wheat, E. KNEEN and M. J. BLISH. (Nebr. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 1, pp. 1-26, figs. 7*).—Seedlings of the Minhardi, Minturki, Cheyenne, Kawvale, Blackhull, and Fulcaster varieties of winter wheats grown in flats were subjected to controlled low-temperature hardening, constant 2° C. in a refrigerated greenhouse, and high-temperature hardening. The sucrose and dry matter contents increased in both leaf blades and crowns throughout the 7- to 8-week hardening period and fell rapidly when the plants were dehardened, and resistance to cold, as measured by response to freezing, followed a parallel course. When evaluated by either criterion, both hardening and dehardening responses were varietal in nature and were closely comparable to field behavior. Crown composition showed a better correlation with cold resistance than did leaf composition. The cold resistance of neither roots nor leaf blades was a reliable index of the cold resistance of the plant. Survival seemed to be entirely dependent on the ability of the crown to resist frost injury. The respective studies conducted in fall, winter, and spring showed that plants hardened adequately under either decreasing or increasing day lengths. Light intensity was an important factor, for any diminution of light resulted in decreased efficiency of hardening, as measured either by increase in cold resistance or by storage of reserves.

Is it possible that seeds through treatment with light may keep their germinating power through a longer span of years than normal? C. JENSEN (Köbenhavn (Copenhagen): *J. D. Quist & Co., 1941, pp. 16+[5, figs. 6]*).—The experiments with seeds of various plants reported appear to indicate a prolonging of viability by treatment with artificial light (Quartz and Sollux lamps).

Yields of Korean lespedeza as affected by dodder, R. E. STITT. (U. S. D. A., N. C. Expt. Sta., et al.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 12, pp. 969-971*).—Hay made from dodder-infested Korean lespedeza at Statesville, N. C., containing 28 percent of dodder yielded about the same as dodder-free plats, but sustained some loss of leaves and considerable loss of color, and seed yields of the lespedeza were reduced by the dodder from 712 to 212 lb. per acre. The protein content of dodder slightly exceeded that of the lespedeza on which it was grown but was somewhat less than that of lespedeza grown free of dodder. Dodder contained only about half the amount of crude fiber found in lespedeza.

A study of nut grass (*Cyperus rotundus* L.) in the cotton soil of the Gezira.—I, The maintenance of life in the tuber, F. W. ANDREWS (*Ann. Bot. [London], n. ser., 4 (1940), No. 13, pp. 177-193, figs. 2*).—The tubers of nutgrass normally do not lie deeper than 12 in. in the Gezira cotton soil, which is a heavy clay, strongly alkaline (pH up to 9.4), of low permeability to water, and low in nitrogen and humus. Tubers severed from their roots died after 14 days' exposure to the sun. Deep cultivation during the dry season below the depth of the lowest tuber which cuts the tuber roots and allowing the severed tubers to remain in the dry soil for at least 1 mo. provided a rapid and effective control method involving only one operation. The vegetative characters of nutgrass in the Gezira are described¹.

HORTICULTURE

Experimental designs to increase accuracy of greenhouse studies, W. J. YOUNDEN (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 3, pp. 219-228).—Even in the comparatively well-controlled conditions of a greenhouse, well-designed distribution of test pots contributed markedly to the accuracy of the results. In one experiment the standard deviation for a single pot was reduced from 7.2 to 3.1 gm. by planning. It is suggested that the design should take the fullest possible advantage of known or suspected similarities in the material or environment. The author presents a number of new arrangements of Latin squares with missing rows which should be helpful in planning greenhouse studies.

Some effects of treatment of non-dormant seeds with certain growth substances, L. V. BARTON (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 3, pp. 181-205, figs. 4).—Various vegetable, flower, and crop plant seeds were treated with growth substances in the form of vapors, liquids, or dusts, and the effects on germination and early growth were recorded. Soaking seeds in solutions of K α -naphthaleneacetate at concentrations of 320.0, 106.6, 35.5, 11.8, 3.7, and 1.2 mg./l. failed to increase the speed or percentage of germination. Higher concentrations caused injury. Powder treatments with various proprietary materials were without stimulating effects. In the case of eggplant, radish, and stock seeds germinated on moist filter paper, the seedlings of nine varieties were increased in length by certain treatments. Such an increase was not obtained in soil-grown seedlings. Treatment of various grasses and grain seeds caused no effect on growth rate or time of maturity. No significant effect of treatments on the number of plants to flower or on the number of flowers produced was observed in the larkspur, marigold, stock, or zinnia. Treatment of radish seeds with higher concentrations caused in some cases a constriction of the taproot with an enlargement below, giving the appearance of a double root.

Some effects of treatment of seeds with growth substances on dormancy, L. V. BARTON (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 3, pp. 229-240, figs. 4).—The treatment of dry dormant seeds with growth substances in concentrations of 3.7 to 320.0 mg./l. had no effect on the apple and crabapple, but in the American elm there was an apparent benefit from the application of solutions of 35.5, 11.8, and 3.7 mg./l. of K α -naphthaleneacetate. The benefit was so slight that the treatment could not be substituted for either low-temperature pretreatment or soaking in water under light. The germination of flowering dogwood, red-osier dogwood, apple, and crabapple seeds which had been afterripened at 5° C. was inhibited by treatment with growth substances. Growth-substance treatment of germinated seeds of *Lilium auratum*, *Paeonia suffruticosa*, and *Viburnum* sp. failed to initiate growth of the dormant epicotyls.

Soiless culture simplified, A. LAURIE (*New York and London: McGraw-Hill Book Co.*, [1940], pp. XIII+201, figs. 22).—Prepared in an easily readable form, this text presents information on the principles and operations of growing plants by the solution culture method.

[Variety tests of fruits and vegetables in Mississippi,] C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 2, pp. 5, 6).—Information is presented on the yields of tomatoes, edible soybeans, peaches, apples, plums, and pears growing at the Delta Substation and on variety, fertilizer, and cultural trials with cabbage, tomatoes, peas, sweet corn, and snap beans at the Truck Crops Substation.

The home garden and orchard, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 1, pp. 5, 6).—Among studies reviewed are pruning and training of tomatoes, variety and breeding of tomatoes, N requirements of foliage

crops, pole bean variety tests, varieties and fertilization of pickling cucumbers, cultural treatment of grapes, testing of fruit varieties, training of peaches, and the use of electric light to retard the blooming of chrysanthemums.

Colloidal clay culture for refined control of nutritional experiments with vegetables, W. A. ALBRECHT and R. A. SCHROEDER. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 689-692).—Stating that colloidal clay would duplicate very closely the salient features of the soil and at the same time permit a complete chemical control of the medium in which the vegetables were growing, the authors discuss the qualities of colloidal clay, the importance of the colloidal fraction of the soil, the preparation of colloidal clay for plant growth, and suggest uses for hydrogen clay.

Fertilizers for truck crops, W. B. ANDREWS and J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 8 (1940), No. 12, p. 7).—Information is presented as to the amounts, composition, costs, and preparation of fertilizers for truck crops. It is advised not to use acid-forming materials or sulfate of ammonia without supplying dolomitic limestone to provide Ca and Mg.

Edible and poisonous fungi (*[Gt. Brit.] Min. Agr. and Fisheries Bul.* 23, 5. ed. (1940), pp. V+26, pls. 25).—Illustrated in color, this handbook (E. S. R., 67, p. 23) presents information on edible and poisonous species in a form designed to assist interested persons in distinguishing readily the two groups.

A comparison of performance of green and white asparagus, G. C. HANNA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 770-772, fig. 1).—With cultivation and irrigation identical except that one treatment was ridged, there was over a period of 8 yr. no significant difference in yield between green and white Mary Washington asparagus. The mean weight of spears was significantly larger for the white, but the greater number of spears harvested per crown for the green compensated for this difference. The daily yield was higher for the white rows, but the loss in production due to ridging offset this gain.

The depth of planting asparagus and its effect on stand, yield, and position of the crown, R. E. YOUNG. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 783-784).—In the spring of 1928 a series of asparagus plats was established with the tops of the crowns 2, 4, 6, and 8 in. below the surface. Although normal cultivation with spring disking was given all the plats, the loss of plants from the 2-in. plat was only about one-third that where the crowns were 6 or 8 in. deep. After the third or fourth year there was little change in the stands. Yields per plant were about the same for all depths, but due to more plants the shallow plats produced the greater yields. An examination of the beds in 1939 showed considerable variation in depth of crowns irrespective of original levels, indicating an adjustment on the part of the plants.

The effect of manure treatments upon the availability and penetration of phosphorus in an asparagus fertilizer experiment, E. M. RAHN. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 715-717).—To measure the effect of manure in rendering or keeping available the phosphorus added in commercial fertilizers, a number of different treatments were compared on a field of asparagus which had been uniformly fertilized in the preceding 5 yr. The only treatments which increased yields significantly were those in which P and manure were applied together. No significant response was secured by varying either the N or K applications. Apparently P was the limiting factor and was rendered available only when manure was used with the P. The plowing-under of manure or other organic materials carried the P down several inches where the asparagus roots could utilize it. The use of mechanical methods of placing the P fertilizer at proper depths was being investigated.

The interrelation between the effect of fertilizer composition and the method of application on the germination and growth of lima beans and snap beans, M. M. PARKER. (Va. Truck Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 737-742).—Studies conducted in 1939 on plats established on a heavy and on a light phase of Sassafras sandy loam showed that the rate of germination of Bountiful beans was influenced considerably by the method of placement and the concentration of various ingredients in the fertilizer. Carriers of N when placed in potentially dangerous positions had the greatest retarding effect. Potash also had a retarding influence. When placed in bands, 2 in. to the side and 2 in. below the seed, the injurious effects of both materials were eliminated. Soil moisture during germination was important as shown in the fact that lima beans suffered little injury because of greater rainfall during germination. Potash increased the yield of lima beans when placed safely. Snap beans responded significantly to 5 percent K placed in bands at each side of the seed row or in a single band directly beneath. With respect to P, a significant yield response of lima beans was recorded when the P was increased from 0 to 6 percent where the fertilizer was applied in side bands or as a side dressing. An increase to 12 percent had no further increasing effect. Side dressing with P did not increase the yield of snap beans, possibly because of their shorter life. In some cases it was apparent that the potential benefits from P were offset by the injury caused by the associated N and K.

The storage of broccoli and cauliflower, W. H. SMITH (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 287-293).—Cauliflower and broccoli were found to behave in the same manner in storage, and a temperature of 32° F. with a relative humidity of 95 percent was found desirable both in air and modified storage. A modified atmosphere containing 10 percent CO₂ was more effective than 5 or 15 percent. In the absence of CO₂ the reduction of the O₂ to 10 percent did not retard deterioration appreciably. With suitable varieties, a modified atmosphere containing 79 percent N₂, 11 percent O₂, and 10 percent CO₂ at 32° made possible storage for from 4 to 5 weeks.

Sweet corn hybrid varieties in test at Crystal Springs, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 12, p. 8).—Of yellow sweet corns tested by the Truck Crops Substation, Aristogold Bantam No. 1 and 2E led in yield in 1939 and 1940. Silver Cross No. 3 led the white varieties for marketable ears per acre. Aristogold Bantam No. 1 required 89 days from planting to harvest, and Silver Cross No. 3 94 days.

Maturity studies on new sweet corn hybrids, F. A. LEE and C. B. SAYRE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 759-762).—Using as measures the percentage contents of alcohol insoluble and total solids, a considerable number of hybrid sweet corns were compared as to the duration of the period that the kernels remained in the fancy stage. Because of much lower temperatures in late season, the late hybrids had a distinct advantage. Golden Cross Bantam compared most favorably with the newer hybrids in the duration of the fancy stage. Kingscrot E5 had a longer period of good quality, and Quaker Hill XL, Golden Bantam 51509, and Bantam Evergreen Hybrid were promising among the later-maturing kinds.

Fruiting of the Powdery Mildew-Resistant No. 45 cantaloupe as affected by spacing, W. A. FRAZEE. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 831-835).—Where Powdery Mildew Resistant No. 45 muskmelons were thinned to stands of 5, 8, 10, 12, 15, 20, 25, and 30 in. in the row, the marketable yields were highest for the 5- and 12-in. spacing, with consistent decreases beyond 12 in. Melons were larger with the wider spacing, but not

significantly so. Sunburn became a serious factor with the very widest spacings. At 5 in. the culls were increased greatly because of poor netting. The number of fruits ripened per vine increased progressively with the increase in spacing. There was no effect of spacing on the number or ratio of male and hermaphroditic flowers.

The effect of indol-acetic acid on fruit-setting in muskmelons, P. C. BURRELL and T. W. WHITAKER. (Univ. Calif. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 829-830).—Pointing out the difficulty of obtaining high percentage sets from hand pollination, the authors discuss the results of a study in which immediately after the flowers had been pollinated a small amount of paste made up of 1 percent indoleacetic acid in lanolin was applied to one lobe of the stigma. The percentage set was higher significantly in the treated series than in the controls, and the treated melons contained approximately as many viable seed as the untreated.

Correlation studies of certain characters of the fruit of *Cucumis melo*, J. C. HOFFMAN. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 836-838).—Measurements of 10 fruits from each of 15 varieties or strains showed a high degree of negative correlation between weight and density. With two exceptions density was definitely correlated with the cavity factor. In seven cases there was a well-defined correlation between weight and cavity factor. In two cases there was a significant negative correlation between refractive index and density of sliced melon. The correlation between weight of fruit and density was highly significant in all except three lines.

Early planting is first requirement for choice lettuce, L. R. FARISH (*Miss Farm Res. [Mississippi Sta.]*, 4 (1941), No. 1, p. 8).—The exposure of lettuce to a daily maximum temperature of 85° F. or more for a week or more in spring caused premature seed stalk formation and the development of a bitter flavor. Lettuce should mature before the occurrence of high temperatures, which usually arrive the second week in May. January 15 to February 1 is deemed the optimum planting date at State College. Among better varieties were New York No. 12, Imperial 847, and Imperial 44. Nitrate of soda as a side dressing was helpful in stimulating development.

Variation in water table and soil moisture content of peat soil due to growth of lettuce, E. M. ANDERSEN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 693-696, figs. 3).—Records taken on moisture and temperature relations in a uniform, well-decomposed, woody type of peat about 10 ft. deep and which had been under cultivation for 24 yr. and upon which were growing crops of Imperial 44 lettuce showed that the plants depleted soil moisture progressively as they approached maturity. The change was indicated in an increased soil tension and by a lowered water table. The soil moisture tension was found a sensitive index of soil moisture conditions.

The influence of nitrogen, phosphorus, and potassium on the yield of Alaska peas grown on soils of known fertility level, J. L. BOWERS and C. H. MAHONEY. (Univ. Md.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 707-712).—A study of the response of Alaska peas growing in jars of soil collected from peafields near Ridgely and Fruitland, Md., to differential fertilizer treatments showed that the level of fertility in the original soil is an important factor in determining responses. In general, N appeared to be a more important limiting factor than P or K, and the results suggested that present formulas might be modified to contain more N and less of the other two elements. In the case of the soil of high fertility level from Ridgely, N used alone was valuable, but when combined with P and K the results were not significant. Apparently the use of the complete fertilizer had increased the concentration of P and K

to an injurious degree. On the Ridgely soil of low fertility N alone produced higher yields than when combined with K, suggesting that K had a depressing influence in the absorption of N. The study suggested that greenhouse experiments are valuable as a guide in planning fertilizer projects in the field.

The relation of color and maturity of pods with tenderometer readings, maturity grade scores, and alcohol insoluble solids of peas grown for canning, C. H. MAHONEY. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 725-728).—The usefulness of a method of measuring canning maturity based on the color and appearance of pods was checked with the results of other tests, but no significant relation was found between the appearance of immature or fairly mature pods and the quality of the canned product as measured by either maturity grades or alcohol insoluble solids. The correlations between the percentage of mature pods and maturity grades of No. 3 sieve peas and with alcohol insoluble solids of No. 4 sieve peas were significant. Significant correlations were obtained also between the percentage of immature pods and mature pods with tenderometer readings of both No. 3 and No. 4 sieve peas, but the coefficients were negative in case of the immature and positive for the mature pods. It is pointed out that various factors such as root rots, aphids, and wilt may cause premature ripening of vines and pods without any material change in the peas themselves as compared with green vines in the same field.

Characters for the classification and identification of varieties of *Capsicum*, H. L. COCHRAN. (Ga. Expt. Sta.). (*Bul. Torrey Bot. Club*, 67 (1940), No. 8, pp. 710-717, figs. 6).—A study of the measurements taken on the leaves and fruits of 59 varieties of peppers grown both as a greenhouse and as a field crop showed a definite relationship between leaf and fruit size, but little correlation between leaf and fruit shape. Fruit shape was more susceptible than leaf shape to environmental influences, but both characters proved to be relatively constant. It is suggested that the leaf and fruit index may be valuable when used with certain other plant characters in the classification and identification of pepper varieties, but that it is apparently of little value when used alone.

Louisiana Gulf States Market lead tomato varieties, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 1, p. 8).—Of 23 varieties tested for earliness and yield, Louisiana Gulf States Market led in production of U. S. No. 1 and 2 fruits in 1940. Asgrow Scarlet Dawn and a strain of Gulf States Market produced more No. 1 and less No. 2 fruits than the above variety. Other promising varieties were John Baer, Clark Special Early, Bonny Best, and Rutgers.

Foliar diagnosis study of climatic influence on the nutrition of spring and fall grown greenhouse tomatoes, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 117-144, figs. 13).—Studies made upon the plants of two greenhouse crops of Marglobe tomato, one set in the beds on August 15 and the other on March 9 and both culturally handled in the same manner, showed consistently higher yields from any given treatment in the spring crop. The range of differences in yield from different treatments was also much greater in the spring crop. Foliar diagnosis of the fifth leaf from the base of the plants showed that the intensity of nutrition resulting from a given treatment is always higher in both the manured and unmanured series in the fall crop. The quota of both N and K in the NPK unit decreased progressively with increasing age of the leaf in both series during both spring and fall. The quota of phosphoric acid in the NPK unit increased progressively with increasing maturity of the leaf in both series during both seasons.

Whereas in the spring the addition of N caused an increase of this element in the value of the intensity of nutrition, under fall conditions the increase occurred only during the latter part of the cycle and was relatively feeble. The addition of K produced a marked increase in the value of this element in the magnitude intensity in both spring and fall. The higher yields for any given treatment in spring are associated with a lower value for the quota of N and also for phosphoric acid in the composite NPK unit and a higher value for K.

Fruit abnormalities of tomatoes grown in various culture solutions, G. J. RALEIGH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 895-900, figs. 2).—Plants set January 28 in jars containing a nutrient solution lacking in boron showed a browning of the fruit and abscission of small fruits but no typical blossom-end rot. When B was added the fruits resumed growth but were rough in appearance. Plants grown without P were evidently able to secure sufficient P by reutilization of materials obtained during the pretreatment stage. No differences in blossom-end rot related to P were seen. A lack of either N or K had no apparent effect on the incidence of blossom-end rot. Where Ca was withheld there was a rapid development of rot with the plants showing yellow foliage with necrotic spotting of the upper leaves. Whether the rot was due to a lack of Ca for building of the middle lamella or to a toxicity of other ions in the absence of Ca or to some disturbance in the N metabolism was not certain. Since blossom-end rot is often severe on high-lime as well as low-lime soils, it is deemed probable that the trouble as manifested in the field is due to some moisture relation rather than to insufficient Ca.

Parthenocarpic and normal fruits compared as to percentage of setting and size, F. G. GUSTAFSON (*Bot. Gaz.*, 102 (1940), No. 2, pp. 280-286, fig. 1).—A comparison of chemically induced parthenocarpic and normally pollinated fruits produced on the same cluster of John Baer tomato plants at Ann Arbor, Mich., showed the former to average somewhat smaller. At Pasadena, Calif., on the other hand, fruits produced by indolebutyric and phenylacetic acids were as large if not larger than those produced by pollination. Apparently the greater fertility of the soil at Pasadena was a factor. The author believes that the growth resulting from chemical treatment is the same as that from pollination except that ovules do not develop in the first instance.

The relation of organ size to meristem size in the tomato, W. G. WHALEY (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 910-912).—Measurements of the size of the shoot apical meristem and of flowers and fruits in the parents and progeny of two interspecific tomato crosses showed a direct relation between the size of the shoot apical meristem and that of the determinate organs. No correlation was established between the size of the meristem and total yield, nor could hybrid vigor be associated with meristem size.

The use of glycerin in shipping tomato plants, J. D. HARTMAN and E. C. STAIB. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 916-918).—In the case of tomato plants shipped from Tifton, Ga., and from Owensville, Ind., to La Fayette, Ind., soaking the peat in which the roots were packed with a glycerin solution had no noticeable effect on growth or appearance in the field. Mortality was almost negligible in all lots. There was no significant difference in yield between the treated and untreated plants of each shipment, but glycerin apparently delayed maturity to a slight degree, indicating the presence of some physiological effect.

Irrigation studies with watermelons, L. D. DONEEN, D. R. PORTER, and J. H. MACGILLIVRAY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 821-824, figs. 2).—In 3 years' experiments at Davis it was evident that

watermelons may be grown successfully over a rather wide soil moisture range. In 2 of the 3 yr. the size of fruits was slightly larger on the irrigated plots, but there was no material difference in yield, days to maturity, or in the shape ratio of the fruits. In 2 of the years there were fairly large differences in composition as shown by field refractometer readings in favor of the melons without irrigation.

Magnesium deficiency of fruit trees: The comparative base status of the leaves of apple trees and of goosberry and black currant bushes receiving various manurial treatments under conditions of magnesium deficiency, T. WALLACE (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 261-274).—The base status of the leaves of apple trees and gooseberry and black currant bushes growing on similar soils under conditions of Mg deficiency was found to vary, irrespective of manurial treatments, due to differences in ash contents and the proportions of lime and K in the ash. In particular, the bush fruits showed high and the apple low ash contents. The status of magnesia in the three species was similar. Values of 0.4 percent MgO and 20 milligram equivalents of MgO per 100 gm. of dry matter are suggested as the approximate levels below which Mg deficiency will occur in all three species.

Glutathione and the rest-period of buds, J. P. BENNETT, J. OSERKOWSKY, and L. JACOBSON. (Univ. Calif.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, pp. 883-887).—By means of rubber tubes, solutions of glutathione and yeast extracts, with distilled water as a check, were supplied to decapitated twigs of 1-year-old grafted trees which had been brought into the greenhouse late in the autumn after exposure to low temperature. The results indicated that glutathione plays little, if any, part in the rest-breaking action of yeast extracts on buds of the apple, pear, and peach. The observed effects of large doses of glutathione are believed to result from the presence of some active substance or substances carried along with the glutathione in its preparation from yeast or other biological materials. This idea was supported by the fact that locally prepared glutathione was more active than commercial forms which were presumably purer. The addition of glutathione to active yeast extract did not increase the effectiveness of the yeast.

The carbohydrate relations of a single scion variety grafted on Malling rootstocks IX and XIII: A contribution to the physiology of dwarfing, Y. V. RAO and W. E. BERRY (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 193-225, pl. 1, figs. 14).—In the case of Crawley Beauty apples grafted on Malling IX and XIII stocks concentrations of reducing sugars and disaccharides, expressed as percentages of the water content and of starch as percentage of residual dry weight, were higher in the bark and wood of the scions on resulting Malling IX roots. Carbohydrate concentrations were higher in the bark than in the wood of both stocks and scions. The seasonal variation in the carbohydrate fractions in the scion on Malling IX differed from that of the scion on Malling XIII. Starch accumulation began several weeks earlier in the Malling IX than in the Malling XIII stocks. There was no indication of interference with the downward movement of sugars at the grafting union. Since the water content of the Malling IX stocks and scions was appreciably less, it is suggested that water deficiency may have been the primary cause of both starch accumulation and growth cessation.

Trials of clonal apple rootstocks selected from "free" and "crab" seedlings, I, II (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 226-238, 239-248).—Two papers are presented.

I. Performance at Long Ashton when worked with five scion varieties, G. T. Spinks.—Observations on the growth of Worcester Pearmain, James Grieve, and Lane Prince Albert grown as bushes and of Worcester Pearmain, Newton

Wonder, and Blenheim Orange grown as standards on 15 different rootstocks showed marked variability due to the stocks. In almost every case Malling XII produced the largest trees, although in some instances G8 gave trees almost as large. Trees on Malling XII cropped lightly in the earlier years, but were gaining rapidly in production at the end of the experiment. Rootstocks associated with good yields were Malling II, E7, E8, F11, and G7. Crops were rather light on G8 and still smaller on Malling XII. Rootstocks E8, F11, and G7 are considered promising as semidwarfing stocks.

II. Performance at East Malling when worked with Lane's Prince Albert, T. N. Hoblyn.—In a test of Lane Prince Albert apples on different clonal and seedling rootstocks, it was observed that at least three of the Malling rootstocks were outstanding in their stimulation of vigorous growth. Two Long Ashton stocks, G7 and F11, were promising as semidwarfing stocks. Difficulties in propagation encountered in E7 and Malling A and C stocks prevented their recommendation despite the fact that they produced vigorous heavy-yielding trees.

Effect of claypan on the growth and production of apples in California, R. E. STORIE (Calif. Expt. Sta.). (Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 317-322, figs. 8).—In Studies in Santa Cruz County, an old established apple-growing area characterized by mean annual rainfall between 20 and 35 in. occurring mostly from November to April, it was found that soils having very dense clay subsoils produced small stunted trees that were short-lived and rather shallow rooted. On Soquel loam, a fertile bottom land soil, apple yields ranged from 700 to 2,420 boxes per acre and the trees were large, long-lived, and deep rooted. When apple production records were correlated with soil types, it was noted that the production curve paralleled the general soil rating rather closely.

A long period field experiment on the manuring of apple trees, T. WALLACE and G. T. SPINKS (Jour. Pomol. and Hort. Sci., 18 (1940), No. 3, pp. 182-192).—In discussing the results of a fertilizer trial with Edward VII and Allington apple trees, it is pointed out that during the period 1924-35, growth, blooming, and fruiting were all significantly affected by the position of the tree, manurial treatment, and time of applying manures, but not by the form of N whether organic or inorganic. Spring applications were the most and summer the least effective. No treatment counteracted the biennial fruiting habit of the Allington variety. The percentage of rot in both varieties placed in ordinary storage was less in the fruit of the no-manure plats. In the second period, 1936-39, the withholding of manure resulted in such a decrease in vigor, blooming, and fruiting that treatments were resumed in 1939.

Thinning as a means of correcting biennial bearing in apples, D. V. FISHER and J. E. BARRON (Sci. Agr., 21 (1940), No. 3, pp. 105-114, figs. 2).—Blossom thinning and extra heavy early fruit thinning were found effective in reestablishing annual bearing in Newtown and Winesap trees that had taken on a biennial habit. The restored annual habit was maintained by thinning to one fruit per cluster in subsequent years. Total yields were increased greatly on trees changed from biennial to an annual bearing condition. In the Newtown, size of fruit was so greatly increased as to cause much of the crop to grade too large for most profitable marketing. However, in varieties such as Delicious, Rome Beauty, and Duchess, where moderate to large sizes bring the better returns, blossom thinning would appear desirable.

Adjusting apple yields for differences in size of tree, J. C. WILCOX (Sci. Agr., 21 (1940), No. 3, pp. 139-148).—Using as base material data taken on some 400 McIntosh trees in growers' orchards, it appeared that the best method of adjusting for differences in size of trees was the use of the regression coefficient

obtained from the regression of yield on size of trunk. Differences in degree of pruning and severe crowding of trees in the orchard lessened the reliability of the suggested method. In mature trees satisfactory results were obtained only when each tree was surrounded by a full complement of trees of the same variety and size. By adjustments for both size and distance of planting the method could be applied to trees planted at different distances.

The histological structure of the flesh of the apple in relation to growth and senescence, W. H. SMITH (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 249-260, figs. 5).—Within a single variety a positive correlation was observed between the average size of cells in the flesh and the weight of the mature fruit. The larger fruits had also the larger number of cells. Fruit size at maturity was thus determined by both the amount of cell multiplication and the degree of cell enlargement. Apples of different varieties were found to vary widely in cellular structure. Early-maturing varieties had a larger number of cells per unit weight of tissue, and this characteristic was associated with high respiration rate and poor keeping quality.

Better stocks for apples and peaches, J. A. MCCLINTOCK. (Purdue Univ.). (*Ind. Hort. Soc. Trans.*, 1939, pp. 11-24, figs. 10).—Stating that the Virginia Crab on its own roots has proved the best stock for Grimes Golden apple in Indiana, the author discusses methods of producing good rootstocks of this variety. In the case of Virginia Crab grafted on seedling roots, the use of growth-promoting substances was found helpful in stimulating the development of sturdy roots on the Virginia Crab scion. Grafted trees were planted so that 6 to 8 in. of the scion trunk was covered with soil.

Discussing peach stocks, the author states that *Prunus davidiana* because of its low temperature resistance shows promise as a rootstock for Indiana peaches but cannot be recommended because of scarcity of material. Plums proved to be of little value because of a lack of suitable affinity with the peach. The greatest promise in peach stocks at present is said to lie in selections from southern "naturals", and mention is made of the possible use of red or copper-leaved naturals.

Trends in peach production; varieties and soil management, F. P. CULLINAN. (U. S. D. A.). (*Ind. Hort. Soc. Trans.*, 1939, pp. 24-32).—In this general discussion data are presented on the time of ripening of peaches at Beltsville, Md., and on the relation between gains in circumference and yield in the Elberta variety.

Studies on the physiological changes in peaches during handling and railroad shipment, K. MATSUMOTO (*Mem. Col. Agr., Kyoto Imp. Univ.*, No. 46 (1939), pp. 79, pls. 2, figs. 18).—Readings on the internal temperature of peaches on the tree showed that temperature follows rather closely that of the surrounding air, with variation due to shading by leaves. Because of lower temperatures in the morning this time is deemed best for harvesting fruit. When peaches were placed in cold storage there was at first a rapid decline in temperature, this becoming much slower as cooling proceeded. Respiratory intensity in attached peaches was highest in the early stages, declining to a low point about the time of maximum growth. As full maturity approached, there was an acceleration in respiration. Rate of fruit growth was low in the young stage, increasing gradually to attain a maximum about 15 days prior to maturity. Reducing sugar was high and sucrose low in the immature peach, with a reverse at the approach of maturity. Peaches taken from cold storage respired for a time at a higher rate than those which had not been cooled. Respiration and temperature records on precooled and nonprecooled peaches during shipment

by rail indicated the value of precooling and icing during transit. Icing lowered the rate of respiration and delayed the onset of spoilage.

Gas storage of peaches, F. E. HUELIN and G. B. TINDALE (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 1, pp. 34-38, figs. 2).—Fruits picked in a firm condition, 15 lb. or more of pressure resistance, had their storage life prolonged by placement in modified atmospheres. The most effective atmosphere was that containing from 8 to 10 percent CO₂ and from 11 to 13 percent O₂. It was necessary to submit peaches to a post-storage temperature of from 60° to 65° F. to attain satisfactory edibility following treatment. Where peaches were picked rather soft, 10-lb. pressure or less, gas storage was ineffective and even decreased storage life.

Observations on fertilizing and harvesting cranberries, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg.*, 71 (1941), pp. 13-15, 18-19).—Comparing November and June applications of fertilizer, 300 lb. per acre, to a young planting of Howard Bells cranberries, some evidence was obtained in the first commercial harvest that the June treatment was more effective. In another experiment on an Early Black bog hand-picking gave (except for one season out of six) consistently higher yields than did scooping. There was no well-defined evidence that scooping had decreased the producing capacity of the vines.

Unfruitfulness in black currants, M. LEDEBOER and I. RIETSEMA (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 3, pp. 177-180, pls. 2).—Microscopical studies of sections of the fixed and stained flowers of the pollinated black currant showed that self-unfruitfulness is not a result of the failure of the pollen tube to grow through the style. In fact, the tubes entered the ovules and in some cases contacted the embryo-sac nucleus without fusing. Ovaries with less than four fertilized ovules dropped.

Citrus culture [trans. title], R. B. PIERES ET AL. (*Bol. Frutas y Hortalizas [Argentina]*, 4 (1939), No. 39, pp. 288, pls. 2, figs. 155).—This article contains information on citrus growing in Argentina from the viewpoint of varieties, selection of site and preparation of soil, propagation, fertilization, culture, control of insect and fungus pests, harvesting, marketing, and storage.

Bud-shoot wilt of citrus nursery trees, F. F. HALMA. (Univ. Calif.). (*Calif. Citrog.*, 26 (1941), No. 4, pp. 86, 106-107, figs. 2).—Attention is called to a physiological abnormality in citrus nurseries which is characterized by a sudden wilting and subsequent death of the initial sprout of fall-budded trees. Finding no evidence of micro-organisms, the author concludes that the wilting is due to an incomplete union of the conducting tissues of the bud and root-stock, thus preventing adequate water from passing to the sprout to maintain it during hot, dry weather.

Broad program of tung research by experimental field, S. R. GREER (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 12, pp. 1, 7, 8).—Information is presented on the development and work program of the Experimental Tung Field started in 1938.

[**Experiments in Mississippi with tung trees**], C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 2, p. 6).—At the South Mississippi Substation the highest yields were obtained from tung trees fertilized with nitrate of soda and cultivated during 4 of their 6 yr. in the orchard. Where trees were fertilized, better yields were obtained where cultivation was given for 4 yr. rather than the full 6-yr. period. On the other hand, no cultivation at all was definitely detrimental irrespective of fertilizer treatment.

Developing the framework of tung trees from dormant buds, J. C. ROBERT (*Mississippi Sta. Cir. 102 (1941), pp. 7, figs. 5*).—Herein is described a method for training young tung trees to offset the natural growth habit of forming whorls of branches and to obtain in their place scaffold limbs well distributed along the trunk. Dormant buds were forced into growth by making a horizontal incision one-fourth inch above the bud. The removal of the main terminal bud aided in stimulating the development of the desired lateral growths.

The correlation between temperature and tung nut production, J. C. ROBERT. (*Miss. Expt. Sta.*). (*Assoc. South. Agr. Workers Proc.*, 41 (1940), p. 163).—Based on observations from 1932 to 1939 at Poplarville, Miss., the author concludes that the period from February 20 to March 30 may be considered critical in tung oil production. If temperatures fall below 32° F. in this period there are usually poor crops of nuts. Prior to February 20 the trees are sufficiently dormant to escape injury.

New Minnesota varieties of garden chrysanthemums, L. E. LONGLEY and L. SANDO (*Minn. Hort.*, 69 (1941), No. 2, p. 33).—Brief comments are presented on six varieties resulting from station breeding activities.

Natural layering of the flowering dogwood (*Cornus florida*), and underground extension of some plants, H. A. ALLARD. (*U. S. D. A.*). (*Castanea*, 5 (1940), No. 8, pp. 122–123).—Dogwood branches pinned down into the duff layer by fallen trees were observed to root readily along their entire length. The author suggests the possibility that there is some growth-promoting substance in the surface humus layer that favors the rooting of the dogwood.

Effects of talc dusts containing phytohormone, nutrient salts, and an organic mercurial disinfectant on the rooting of dormant *Taxus* cuttings, N. H. GRACE and J. L. FARRAR (*Canad. Jour. Res.*, 19 (1941), No. 1, Sect. C, pp. 21–26).—"Dormant *T. cuspidata* cuttings were treated with talc dusts containing 1- and 2- γ -naphthyl-butyric acid at concentrations of 0, 500, 1,000, and 2,000 p. p. m., each taken separately and in combination with 0, 0.1, 1, and 10 percent of a mixture of nutrient salts and 0 and 50 p. p. m. of ethyl mercuric bromide. Data on the number of rooted cuttings failed to disclose any significant treatment effects. However, the number and length of roots per rooted cutting were increased by the phytohormone in all concentrations, the effect increasing with ascending concentration. Data for most of the other criteria indicated injurious effects from the phytohormone. The average length of new growth was increased by both the 1 and 10 percent concentrations of nutrient salt in the presence, but not in the absence, of 1,000 p. p. m. of the phytohormone. The 10 percent concentration of nutrient salts decreased the number of cuttings with new growth and the number of such cuttings that were rooted. Organic mercury treatment failed to have any significant effects."

FORESTRY

A study of root development in three soil types in the Duke Forest, W. H. DUNCAN (*Ecol. Monog.*, 11 (1941), No. 2, pp. 141–164, figs. 5).—Observations on the roots of several important forest species growing on three soils showed the greatest development in Orange loam, followed by Georgeville clay and Congaree clay loam. Soil fertility, as indicated by nitrates and C : N ratios, was apparently not responsible for the differences in root development, since there was an inverse relation between root growth and soil fertility. Acid-base reactions did not differ sufficiently in the three soils to account for the differences in root development. There was apparently an inverse relation between available soil moisture and root growth, suggesting that lower available soil moisture may have actually increased root development relative to top development. Differences in total

root development may have resulted, to a certain extent, from the effects of external conditions, such as transpiration and light intensities.

Annual rings in hemlocks and their relation to environmental factors, G. S. AVEBY, JR., H. B. CREIGHTON, and C. W. HOOK (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 825-831, figs. 6).—Measurements of the width of annual rings in trees ranging from 106 to 171 yr. of age, uprooted at New London, Conn., by the September 1938 hurricane showed a decrease in width with age, but the decrease was more than compensated by the greater circumference of the tree. Two habitats were studied, a dry rocky ledge and along a brook in a partially shaded ravine. Growth correlations between the brook and the ledge trees showed a marked degree of relationship in the more or less cyclic fluctuations in annual ring width. However, in all except 11 of the last 63 yr., the brookside trees made the greater annual growth.

Variables affecting vegetative propagation of red and sugar maple, A. G. SNOW, JR. (U. S. D. A. et al.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 395-404, figs. 5).—In experiments with greenwood cuttings collected at various times during early summer and given different auxin treatments prior to planting in outdoor frames, the highest percentage of rooting was obtained with 3 hours' indolebutyric acid treatment at concentrations of 50 mg./l. for sugar and 200 mg./l. for red maple. Clonal differences were indicated, with rooting ranging from 17.5 to 97.5 percent in the 24 red maple clones tested. There was evidence that 4-in. cuttings were better than 6-in. No material difference was noted between indolebutyric and indoleacetic acids under the conditions used. Additional sucrose treatments did not materially increase rooting above the optimum auxin treatments. Variation in physiological maturity may have been a factor in the differential response of clones to treatments at any given date.

Effect of temperature on seed germination, E. I. ROE (U. S. D. A. and Univ. Minn.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 413-414).—Failure to obtain germination of *Acer spicatum*, *A. pennsylvanicum*, and other species of seeds by ordinary stratification and germination treatments led to a test of the effects of different temperatures during the germination period. Seed of *A. negundo*, after stratification for 90 days at 41° F., gave 66.8 percent germination when submitted for 60 days to a fluctuating temperature of 50°-77°. At a constant 50°, the germination was only 7 percent in the same period. Wild American plums (*Prunus americana*) and *P. alleghaniensis* after stratification for 150 days at 41° germinated strongly at 50° constant. Norway maple germinated best at 41°.

Development of cones and seeds in piñon (*Pinus edulis* Engelm.), E. L. LITTLE, JR. (U. S. D. A. and Univ. Ariz.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, p. 68).—A brief abstract is given.

Further studies on polyembryony and germination of polyembryonic pine seeds, G. R. JOHNSTONE (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 808-811, figs. 27).—Multiple seedlings and the presence of multiple embryos of equal or nearly equal development in mature seeds were found in *Pinus cembroides monophylla*, *P. coulteri*, *P. jeffreyi*, *P. lambertiana*, and *P. sabiniana*. Persistence from polyembryony is reported for six other species, *P. monticola*, *P. muricata*, *P. pinaster*, *P. strobus*, *P. thunbergi*, and *P. torreyana*. Polyembryony was usually accompanied by a selective development, with one embryo developing more rapidly than the other or others.

When are pine cones ripe? P. O. RUDOLF (U. S. D. A. coop. Univ. Minn.). (*Minn. Acad. Sci. Proc.*, 8 (1940), pp. 31-38, fig. 1).—Reforestation, now a major conservation activity in the Lake States, depends on an adequate supply of tree seed, and some losses have occurred from the gathering of unripe or overripe

seed by inexperienced collectors. Older methods of determining cone ripeness have proved unreliable in the hands of such individuals, but the present work and other recent studies indicate a close relationship between specific gravity of the cones and ripeness of the seed. As applied, five to six cones from a tree are dropped into the test liquid (kerosene for red pine, linseed oil for white pine), and if half of them float, reasonable assurance may be had of good germination. Cone color also appeared to be a fairly good index of ripeness in red, jack, and white pine cones in Lower Michigan, but it is not so easily defined or accurately measured as specific gravity.

Longevity of red pine seed, E. I. ROE. (U. S. D. A.). (*Minn. Acad. Sci. Proc.*, 8 (1940), pp. 28-30, fig. 1).—On the basis of the results here reported it is concluded that if the seed of *Pinus resinosa* is stored in tightly sealed containers at 32°-40° F. and a moisture content of not more than 6.5 percent, the original viability can be maintained for at least 10 yr. With the moisture content reduced to 5 percent, 40°-50° may be used with safety.

Effect of storage conditions on pollen longevity of *Pinus strobus* and *Pinus resinosa*, J. W. DUFFIELD and A. G. SNOW, JR. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 410-411, fig. 1).—Pollen of *P. resinosa* and *P. strobus*, showing average viabilities of 91.3 and 95.5 percent, respectively, at the start of the experiment in June 1939, was more than 80 percent germinable at the end of 1 yr, when stored at a relative humidity of 50 percent and at a temperature of 0°-4° C. There was no significant difference between 0° and 4°. At 30° pollen lost its viability.

Pollen longevity of *Pinus strobus* and *Pinus resinosa* as controlled by humidity and temperature, J. W. DUFFIELD and A. G. SNOW, JR. (U. S. D. A. et al.). (*Amer. Jour. Bot.*, 28 (1941), No. 2, pp. 175-177).—Essentially noted above.

Growth and mortality during 10 years following partial cuttings in loblolly pine, L. E. CHAIKEN. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 324-329, figs. 6).—In 1930, a 55-year-old, densely stocked, almost pure stand of loblolly pine was partially cut by removing the mature and poorly formed trees and all merchantable hardwoods. Averaging 29,380 bd. ft. per acre prior to cutting, about 9,840 bd. ft. remained after cutting. Measurements 10 yr. later showed an average of 11,125 bd. ft. per acre. The net increment of 128 bd. ft. per year was considerably lower than the average for the region and was accounted for by an unusually heavy mortality following cutting. Also there was an unusual deficiency in precipitation during the 4 yr. following logging. In view of the heavy mortality the author believes it is hazardous to promote the use of a single silvicultural system as the basis of management of forest types as extensive and variable as loblolly pine.

DISEASES OF PLANTS

Hunger signs in crops, edited by G. HAMBRIDGE (Washington, D. C.: *Amer. Soc. Agron. and Natl. Fert. Assoc.*, [1941], pp. [2]+XIII+327, pls. [79], figs. [95]).—The wide range of material on malnutrition in plants here brought together in a single volume marks one more step in the study of nutrition from the soil through plants and on up through man and animals. The following papers, many in cooperation with the U. S. Department of Agriculture and the State experiment stations, are included in the symposium thus presented: Why Do Plants Starve? by G. D. Scarseth and R. M. Salter (pp. 1-13); Plant-Nutrient Deficiency in Tobacco, by J. E. McMurtrey, Jr. (pp. 15-54); Deficiency Symptoms of Corn and Small Grains, by G. N. Hoffer (pp. 55-98); Plant-

Nutrient Symptoms in the Potato, by H. A. Jones and B. E. Brown (pp. 99-124); Plant-Nutrient Deficiency Symptoms in Cotton, by H. P. Cooper (pp. 125-148); Plant-Nutrient Deficiencies in Vegetable or Truck-Crop Plants, by J. J. Skinner (pp. 149-189); Nutrient-Deficiency Symptoms in Deciduous Fruits, by O. W. Davidson (pp. 191-239); Plant-Nutrient Deficiency Symptoms in Legumes, by E. E. De Turk (pp. 241-266); and Symptoms of Citrus Malnutrition, by A. F. Camp, H. D. Chapman, G. M. Bahart, and E. R. Parker (pp. 287-311).

Diagnosis of mineral deficiencies and excesses by systematic leaf injection and analysis, W. A. ROACH (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 27 (1939), pp. 51-58).—It is concluded as a result of this study that the mineral status of plants may be determined rapidly by either or both of two complementary methods—plant analysis and plant injection, and that mineral deficiencies in large plants, such as trees, may be made good commercially by injection. By appropriate procedures nutrient solutions can be introduced into any part of a living plant from, e. g., a selected part of a leaf to the whole plant, and spectrographic and chemical methods of leaf analysis have been evolved which are extremely rapid and sufficiently accurate for a number of elements.

The Plant Disease Reporter, [May 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 25 (1941), Nos. 8, pp. 213-255; 9, pp. 257-277, fig. 1).—In addition to the host-parasite check-list revision, by F. Weiss (No. 8, *Fragaria* to *Gleditsia*, and No. 9, *Gliricidia* to *Hymenoclea*), the following items are noted:

No. 8.—Fungi previously unreported from Missouri, by J. B. Routien; fruit diseases in Idaho, 1940, by E. C. Blodgett; reports on the development of apple scab in Rhode Island, New York, and Illinois; notes on tobacco diseases in Puerto Rico, by H. H. Foster; previously unreported vegetable diseases in Idaho, by W. J. Virgin; notes on *Coleosporium fonesi* (Pk.) Arthur, by G. G. Hedgcock; brief notes on the first record of black pox on apple in Massachusetts, development of the brown rot fungus in New York, and *Sclerotinia sclerotiorum* on ornamentals in Maryland greenhouses; and aftermath of Midwest armistice day freeze, consisting of notes on the damage to orchard trees and small fruits in this area.

No. 9.—Potato seed-source control suggested for elimination of late blight in Lower Rio Grande Valley, by G. H. Godfrey; overwintering of bacterial spot (*Phytophthora pruni*) on peach, by H. H. Thornberry and H. W. Anderson; weather and plant diseases in Oklahoma, by K. S. Chester; wheat condition in Kansas (spring of 1941), by C. O. Johnston; additional reports on diseases of cereals in Texas, Nebraska, and California; diseases newly recorded from various localities, including *Fusicoccum* canker on peach in Massachusetts, flax anthracnose in California, and *Verticillium* wilt of peppermint and *Viburnum* in Indiana; and a brief note on apple scab development in Indiana.

Plant diseases in Texas and their control, A. A. DUNLAP (*Texas Sta. Cir.* 91 (1941), pp. 71, figs. 30).—A handbook presenting information on symptoms and control measures for common plant diseases, arranged alphabetically by hosts, and on diseases capable of attacking many kinds of plants, together with a section on general control methods and materials.

Hyperparasites attacking rust fungi in Oklahoma, J. A. TRAYLOR (*Okl. Acad. Sci. Proc.*, 20 (1940), pp. 57-58).—*Dariuca flum* is reported attacking various species of rust fungi.

Notes on Oklahoma Cercosporae, W. W. RAY. (*Okl. A. and M. Col.*) (*Mycologia*, 33 (1941), No. 2, pp. 174-177).—Four new species, causing leaf infections, are described.

The personal element and light as factors in the study of the genus *Fusarium*, L. L. HARTER. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 2, pp. 97-107).—Studies of 2 species of *Fusarium* indicated that significantly different conidial measurements from the same preparation may be obtained by 2 individuals. The mean length of 50 spores from a single culture may vary considerably, but 150-200 measurements were found to constitute a fairly safe population for establishing spore length. No significant difference in the ratio of 3, 4, and 5 conidial septations occurred in different microscopic mounts from the same spore suspension, but highly significant differences sometimes occurred among culture tubes of the same organism grown on the same medium. The largest number of conidial septations occurred in cultures exposed to light, and the smallest number in those grown in darkness.

Some resupinate polypores from the region of the Great Lakes, XII, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers*, 26 (1940), pp. 107-121, pls. 7).—This installment (E. S. R., 83, p. 785) presents a taxonomic study (including new species) of seven polypores of the genera *Poria*, *Fuscoportia*, *Daedalea*, *Polystictus*, and *Fomes*, some of them responsible for wood decays.

Hybridization between *Ustilago avenae* and *U. perennans*, C. S. HOLTON and G. W. FISCHER. (U. S. D. A. coop. Wash. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 2, pp. 121-128).—These two smut fungi, having no known common host, were hybridized by inoculating wild oats with compatible single-sporidial combinations of the two species. Infection followed on wild oats, but none was obtained from similar inoculations on Victory oats and tall oatgrass. Inoculations with *U. avenae* produced infection on Victory oats and wild oats but not on tall oatgrass, whereas *U. perennans* infected tall oatgrass but not Victory oats or wild oats. Segregates with pathogenicity similar to that of the *U. avenae* parent were recovered from the hybrid chlamydospores by inoculating Anthony oats, but segregates behaving like the *U. perennans* parent were not recovered from similar inoculations on tall oatgrass. When the sexually opposite single-sporidial lines of *U. perennans* were paired with *U. avenae*, *U. levis*, and *U. hordei*, two different degrees of compatibility appeared, viz, fusion of sporidia (1) followed by the production of infection hyphae and (2) without subsequent production of infection hyphae. Infection of wild oats was produced by the former type but not by the latter.

The binomial system of nomenclature for plant viruses, W. D. VALLEAU. (Ky. Expt. Sta.). (*Chron. Bot.*, 6 (1941), No. 10, pp. 223-224).—A review of proposed systems.

Behavior of viruses in tubers, seeds, and fruits [trans. title], K. SILBERSCHMIDT (*An. Prim. Reun. Sul-Amer. Bot.*, 3 (1938), pp. 189-190).—An abstract.

The inactivation of plant viruses by radiation, D. E. LEA and K. M. SMITH (*Parasitology*, 32 (1940), No. 4, pp. 405-416, figs. 6).—Curves obtained by plating against the radiation dosage (ultraviolet or X-ray) the number of lesions following inoculation of a test plant were found to be exponential and the rate of inactivation proportional to the intensity of radiation. The inactivation curves obtained with preparations of a given virus in different states of aggregation did not appear to be systematically different. Consideration of the results indicates that the particles in an aggregated virus suspension cannot be considered as permanent clusters of elementary virus particles, and two possible alternatives compatible with the radiation experiments are discussed, viz, that the aggregation consists of the attachment of a single elementary virus particle to inert matter or that it consists of a reversible union of elementary virus particles, there being a dynamic equilibrium between the aggregates which are constantly dissociating and the elementary particles which are constantly

aggregating The X-radiation dosage required for inactivation is consistent with the view that activation is due to the production of a single ionization in the elementary particle, the size of which is approximately known from filtration experiments.

Problems in breeding for disease resistance, F. C. BAWDEN (*Chron. Bot.*, 6 (1941), No. 11, p. 247).—Discussion of a paper by Reddick (E. S. R., 84, p. 485), with reference to breeding potatoes for resistance to late blight and to virus X.

Preparation of tank-mixed copper fungicides, R. H. DAINES (*New Jersey Stat. Cir.* 410 (1941), pp. [3]).—A revision of Circular 190 (E. S. R., 55, p. 444).

Modern paints for mold control in the brewery, J. C. THOMPSON, JR., and W. E. SANFORD (*Brewers Digest*, 16 (1941), No. 5, pp. 27-30, figs. 4).—It was found that molds could be controlled by constant vigilance, cleanliness, and use of a modern fungicide paint system.

Ability of respiratory-stimulating factors to overcome toxic action of germicides on moulds, E. S. COOK and C. W. KREKE (*Nature [London]*, 146 (1940), No. 3708, p. 688).—This is a preliminary report.

The action of organic compounds as spray materials against infection by rust fungi [trans. title], W. STRAIB (*Zentbl. Bakt. [etc.]*, 2. Abt., 103 (1941), No. 6-8, pp. 73-80).—Picric acid, *o*- and *p*-toluenesulfonamide, and acridine, and especially the first, were shown to possess fungicidal action against cereal rusts.

New findings on the biology of *Erysiphe graminis tritici* [trans. title], M. V. GORLENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 866-870, figs. 3).—Data are presented on the source of inoculum of wheat powdery mildew in spring and on the development cycle of the fungus.

Infection of wheat by *Ophiobolus graminis* as a function of soil moisture [trans. title], A. G. WINTER (*Ztschr. Pflanzenkrankh. u. Pflanzenschutz*, 50 (1940), No. 7, pp. 326-356, figs. 7).—Experimental evidence is presented of the close correlation of high soil moisture with infection by the take-all fungus.

Environmental reaction of physiologic races of *Puccinia triticulturae* and their distribution in Canada, M. NEWTON and T. JOHNSON (*Canad. Jour. Res.*, 19 (1941), No. 4, Sect. C, pp. 121-133).—In the case of a large number of races, both temperature and light exercised a marked influence on the reactions of differential varieties of wheat, but not all in the same direction. All these varieties showed a tendency to become increasingly resistant under short day length and weak light. In general, more pronounced changes in reaction were produced by variation of temperature than of light. In annual surveys conducted since 1931 (except 1932 and 1935), 49 races were identified. Most of the prevailing races were distributed throughout Canada, but some were largely confined to certain areas. Races 1, 53, 76, and 81 were common for several years in eastern Canada but were not encountered in the Prairie Provinces until 1940, whereas races 11 and 53 were largely limited to British Columbia and Alberta. Races of leaf rust have undergone no marked change in identity or relative prevalence in the last few years in Canada.

Some species of *Triticum* and related grasses as hosts for the leaf rust of wheat, *Puccinia triticulturae* Eriks., C. O. JOHNSTON. (Kans. State Col. coop. U. S. D. A.). (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 121-132).—"Seedlings of 1 or more varieties of 19 species of *Triticum*, 4 varieties of rye, 11 selections of wheat×rye hybrids, 1 sample of Michel's grass, and 1 sample of *Elymus condensatus*, varieties of 18 species of *Aegilops*, and 15 species of *Agropyron* were tested with several physiologic races of *P. triticulturae* in the greenhouse." More selections resistant to races 5, 9, and 15 were found in the 7- and 14-chromosome groups than in the 21-chromosome group, but susceptible varieties occurred in each of the groups. *T. timopheeri*, *T. dicoccum* (Vernal variety),

and *T. pyramidale copticum* were nearly immune to all 3 races, and several other species were highly resistant. The resistance of some varieties of wheat to certain physiologic races was as high as that shown by plants with lower chromosome numbers. Further detailed results of the study are presented.

Disease damage in grains, N. E. STEVENS. (Univ. Ill.). (*Sci. Mo.*, 52 (1941), No. 4, pp. 364-366, figs. 3).—With reference to crop acreage control and crop insurance, information regarding losses from disease assumes great importance. This article endeavors to present the available evidence on the subject as it relates to the small grains.

Further experiments on the control by seed disinfection of root-rotting fungi in wheat, J. E. MACHACEK and F. J. GREANEY (*Phytopathology*, 31 (1941), No. 5, pp. 379-394).—In dry-farming areas, disinfection of mechanically sound, smut-free seed wheat with organic mercury dusts increased the yields if such seeds were severely infected by root-rotting fungi, but it failed to increase the yields when such infections were light or when the seeds were free from them. With clean seeds, disinfection may actually reduce the yields. These results are not changed by soil fertilization with ammonium phosphate. In view of these findings, the authors suggest for dry-farming areas either the sowing of untreated, disease-free seeds or the sending of samples to analytical laboratories for testing, the seed wheat to be treated only under advice.

Effect of storage on yields of farm seed treated for disease control—wheat, oats, barley, corn, B. KOEHLER (*Illinois Sta. Bul.* 476 (1941), pp. 257-276, figs. 3).—The extensive use of mercurials and their proved worth for controlling some diseases of small grains, corn, etc., prompted the present experiments to determine the way in which these disinfectants can be used most effectively and economically. The organic mercurials tested were mostly those being sold widely for seed treatment, and in addition tests on wheat and seed corn were made with some copper compounds which, compared with mercury disinfectants, are relatively nonpoisonous to man. The detailed results obtained on wheat, oats, barley, and corn and the recommendations based on them are presented.

Vegetable seed treatments, R. J. HASKELL and S. P. DOOLITTLE (*U. S. Dept. Agr., Farmers' Bul.* 1862 (1940), pp. 11-16, figs. 4).—Directions are given for chemical treatments used in disinfecting and protecting seeds, roots, and tubers, including mercury, Cu, and zinc compounds, formaldehyde, and acetic acid, and also hot water, fermentation soak, and use of aged seed.

Strains of cucumber mosaic virus pathogenic on bean and pea, O. C. WHIPPLE and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 1, pp. 27-60, figs. 15).—Two viruses isolated, respectively, from garden pea and bean (strain 14) and from garden pea (strain 17) at Madison, Wis., in 1935, when compared with cucumber virus 1 and celery virus 1, were found to correspond closely with the last two viruses in "longevity" in vitro, dilution tolerance, and thermal inactivation. Both viruses proved infectious for all the hosts of cucumber virus 1 tested, including tobacco, *Nicotiana glutinosa*, tomato, *Datura stramonium*, pepper, cucumber, muskmelon, squash, watermelon (local lesions), Henderson Bush lima bean, *Lupinus angustifolius*, *L. hartwegii*, spinach, celery, and zinnia. Strain 14 also infected all varieties of bean tested, garden pea, and yellow sweetclover. It also infected systemically cowpea and Fordhook Mammoth Pod lima bean, whereas cucumber virus 1 caused local lesions in the former and no infection in the latter. Strain 17 caused no infection on Fordhook Mammoth Pod lima, local lesions only on cowpea, and systemic infection on yellow sweetclover, otherwise coinciding with cucumber virus 1 in host range (zinnia not tested). It did not infect bean.

The symptoms caused by strain 14 on bean may be said to include all those reported for bean virus 1 and bean virus 2 and they are described in detail. Inoculation of zinnia plants with strain 14 immunized them to local-lesion reaction when inoculated with Price's strain 6 of cucumber virus 1. Strain 17 produced symptoms on pea similar to those of strain 14, except that stem necrosis was more severe, while vein clearing was more pronounced than mottling. Both strains were transmitted by *Myzus persicae*, but attempts at seed transmission in pea and bean were negative. These strains are regarded as members of the cucumber-mosaic virus group of which cucumber virus 1 is the type, but for which infection in pea or bean has not been previously described.

Effect of crown gall formation on the chemical composition of beets, A. C. NEISH and H. HIBBERT (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. C, pp. 613-623).—Studies of tumors resulting from pure-culture inoculations indicated that *Phytoplasma tumefaciens* exerts a local stimulus causing the cells to proliferate, sucrose being converted into cell wall and protoplasm in the tumor cells thus formed. This sucrose is obtained from the normal root tissue by the tumor cells, and the normal tissue is not stimulated by the bacterium to convert it into other materials. Owing to this increased synthetic activity of the tumor cells, an infected root contains more solid matter than a normal one, but less sucrose. The cell wall composition is essentially the same in tumorous and normal tissue. The conversion of sucrose to protein is a major metabolic process in beet root tumors. Ethanolysis of beet root tissue indicates that the lignin present is probably of the same general nature as that in woods.

Disease infection and field performance of bin- and hanger-dried seed corn, B. KOEHLER and G. H. DUNGAN. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 768-781, figs. 3).—Bin-dried seed showed no improvement in quality over corn hanger-dried under good conditions as judged by field tests with seed treated for seedling disease control, but under certain other conditions bin drying would probably have more value. In field tests with representative samples of hybrid seed corn from 22 commercial seed production fields dried in hangers in the agronomy seed house and in drying bins operated by the seed producers, the former averaged 3.2 bu. better in yield over a 3-yr. period. There was no significant difference in yield between corn grown from seed dried at fast and moderate rates, but the slowly dried seed produced reduced stands and yields, attributed largely to fungus infection. Total kernel infections after surface sterilizing the grain averaged 5.1, 18.3, and 69 percent for fast, moderate, and slow drying rates, respectively. The prevalence of *Fusarium moniliforme*, *Penicillium* spp., *Nigrospora* spp., and *Gibberella zeae* was increased most by slow drying. Untreated *Fusarium*-infected seed showed some significant reductions in yield from the seed infection.

Botrytis disease of lettuce, its relation to damping-off and mildew, and its control by pentachloro-nitrobenzene dust, M. J. SMETON and W. BROWN (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 489-501, pl. 1, fig. 1).—The authors discuss the relation of various types of damping-off, of mildew, and of *Botrytis* infection to the problem of carrying crops of lettuce seedlings over winter in cold frames. The efficiency of the fungicide was found to depend to some extent on the nature of the filler, some mildew control following use of a talc filler but none with lime. The fungicide tended to increase frost susceptibility. General recommendations are given.

The brooming disease of common red pepper (*Capsicum annuum*) [trans. title], I. C. KOVACHEVSKY (*Ztschr. Pflansenkrank. u. Pflanzenschutz*, 50 (1940), No. 6, pp. 298-308, figs. 9).—This is believed to be the first report on this virus disease, though diseases very similar to and perhaps identical with it have

been reported by others. It has been known for a long time in Bulgaria, where it is called "wtruntschwane" or "kurtschinjaswane", which correspond to the German "Reisigkrankheit" (of the title) or "Krautern" and the English "rosette disease." The symptoms, virus nature, transmission, and control are discussed in detail, and experimental evidence is presented that this pepper disease is due to cucumber mosaic virus (cucumber virus 1 of Doolittle). It was transferred with difficulty by rubbing in the sap from affected plants, but easily by the aphid *Myzus persicae*.

Potato blights, W. H. MARTIN (*New Jersey Stat. Cir.* 411 (1941), pp. 2).—A revision of an informational leaflet, Circular 192 (E. S. R., 55, p. 444).

Staining scab *Actinomyces* in potato tuber tissues, H. L. HUTCHINS and B. F. LUTMAN. (Vt. Expt. Sta.). (*Stain Technol.*, 16 (1941), No. 2, pp. 63–66, fig. 1).—A procedure is outlined for staining hyphae of the scab organism *A. scabies* embedded in the middle lamellae of tuber cells by a modified gram stain.

Sulphur dusting for the control of psyllid yellows of potatoes, W. A. RIEDL (*Wyoming Sta. Bul.* 245 (1941), pp. 15, figs. 4).—In 2 years' tests S dust gave significant yield increases over control plats in all cases of high psyllid population. Used at the rate of 70 lb. per acre, yield increases over lime-sulfur were significant, and at the rate of 35 lb. they were not significantly lower. The most desirable rate has not yet been determined, but 40–50 lb. should be satisfactory. Plats sprayed with wettable S yielded less than those sprayed with lime-sulfur, and the former is more troublesome to apply. The results indicate the advantage of dusting where spraying is impractical, and dusting may also be advisable where the cost of hauling water or of spray equipment is high or prohibitive. More large-scale testing is needed to answer the question of the comparative economics of spraying and dusting.

Bacterial ring rot of potato, W. A. KREUTZER, D. P. GLICK, and J. G. MCLEAN (*Colorado Sta. Press Bul.* 94 (1941), pp. 12, figs. 4).—An informational leaflet on the disease due to *Phytophthora sepeidonica* and its control, with a progress report on studies being conducted by the Colorado Station.

Potato ring rot (bacterial wilt and soft rot), R. BONDE and O. L. WYMAN. (Coop. Maine Expt. Sta.). (*Maine Agr. Col. Ext. Bul.* 286 (1941), pp. 8, figs. 5).—An informational contribution.

Bacterial ring-rot of potatoes, G. H. STARR and W. A. RIEDL (*Wyoming Sta. Bul.* 244 (1941), pp. 12, figs. 8).—The purpose of the bulletin is to supply practical information on the control and other aspects of this potato disease, due to *Phytophthora sepeidonica*.

The reappearance of potato scab in infested and its appearance in almost uninfested land, B. F. LUTMAN. (Vt. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 3, pp. 65–80, figs. 3).—A plat used in 1914–16 as a testing ground for potatoes and known at that time to be infested with the scab organism, but which had not been in potatoes for 19 yr., was replanted in 1935 with disinfected Green Mountain potato seed, commercial fertilizers being used. Instead of the nearly 100-percent scabby tubers to be expected in susceptible varieties, only 3.3 percent of badly scabbed tubers were found at harvest, and 70 percent of the total were clean. However, many of the latter presented a brown russeted appearance just as dug, which became so inconspicuous on dry tubers that they would have passed for russeted varieties. In succeeding years (1935–40) the proportions of badly scabbed potatoes progressively increased, and the probable causes are discussed. Cases of spread of scab to uninfested land are also noted, in which it would seem that the markedly pathogenic *Actinomyces* organisms were establishing themselves in this soil and acquiring

a parasitic habit. The general conclusions from the study are that, other factors (acidity, humus, previous infection) being approximately similar, soil moisture and the ability to retain a medium moisture are the dominant elements in favoring scab in relatively light sandy loam soil. Soil once infested with scab organisms can be freed from their activity, and 5-6 yr. of continuous cultivation in potatoes are necessary to cause severe and almost complete scabbing.

The effect on seed potatoes of formalin treatment for the destruction of adherent eelworm cysts, M. T. FRANKLIN (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 85-88).—Laboratory tests having shown that cysts of *Heterodera schachtii* adhering to seed potatoes are killed by immersion for 6 hr. in 5 percent formalin solution,* the present study was designed to determine the effects of such treatment on the tubers and the resulting crop. Although only one of the three varieties treated showed no ill effects, they all sprouted normally, and from last year's tests it appears probable that tubers sprouting normally, even though somewhat shriveled, may produce a normal crop.

Bacterium rhaponticum (Millard) Dowson, a cause of crown-rot disease of rhubarb, G. METCALFE (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 502-508).—*B. rhaponticum* is shown to be the cause of this disease, the nematode *Anguillulina dipsaci* playing a secondary role in introducing the bacteria, which are compared to three species of soft rot organisms.

Blind seed disease of rye-grass, H. H. GLASSCOCK (*Nature [London]*, 146 (1940), No. 3698, pp. 368-369).—Following an article by Muskett and Calvert (*E. S. R.*, 85, p. 73), the author presents observations on the occurrence of this disease in Northern Ireland and England.

Blind seed disease of rye-grass, M. WILSON, M. NOBLE, and E. G. GRAY (*Nature [London]*, 146 (1940), No. 3702, pp. 492-493).—This is a discussion of the paper by Muskett and Calvert referred to above, a brief review of the literature with special reference to an early report of *Endoconidium temulentum* parasitizing rye, and preliminary notes on studies, by the authors, of a fungus associated with blind disease of ryegrass which has certain characteristics like *Endoconidium*.

The reaction of a group of sorghums to the covered and loose kernel smuts, L. E. MELCHERS. (Kans. Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 789-791).—The reactions obtained in a selected group of 36 varieties to *Sphacelotheca sorghi* and *S. cruenta* indicated a wide range in susceptibility. Spur feterita C. I. 623 was sufficiently resistant to these smuts to be classed as immune, but all other varieties were susceptible in some degree, details being tabulated and discussed. Using a composite inoculum of *S. sorghi* made up of races 1, 2, and 3, there was evidence that races 2 and 3 remained potent under such conditions, infecting their differential varieties without apparent loss of virulence.

The influence of season and potassic fertilizer on the development of "eye spot" of sugarcane [trans. title], P. O. WIEHE (*Rev. Agr. Maurice*, 19 (1940), No. 2, pp. 57-61, pls. 2).—In the elevated parts of Mauritius where the soils are low in potash, a test to determine the effect of adding this fertilizer ingredient on the disease due to *Helminthosporium ocellum* showed that not only did it fail to inhibit infection on a susceptible variety but plots receiving complete fertilizer appeared to offer resistance to attack.

Some studies on the physiology of *Cytospora sacchari* Butl., the causal fungus of stem canker disease of sugarcane, J. C. LUTHRA, A. SATTAR, and

* *Jour. Helminthol.*, 17 (1939), No. 2, pp. 113-126

S. S. SANDHU (*Indian Acad. Sci. Proc.*, 12 (1940), No. 4, Sect. B, pp. 172-188, figs. 9).—A study of colony growth and formation of pycnidia and aerial mycelium in different culture media under a variety of conditions.

Experiments on the control of smut of sugarcane (*Ustilago scitaminea* Syd.), J. C. LUTHERA, A. SATTAR, and S. S. SANDHU (*Indian Acad. Sci. Proc.*, 12 (1940), No. 4, Sect. B, pp. 118-128).—As a result of these studies it is recommended that no setts from smutted canes be used for planting; that seed setts be disinfected by 0.1 percent $HgCl_2$ for 5 min. or by 1 percent formalin for 5 min. followed by 2 hr. under moist cloth covering; that all smutted plants be rogued out as soon as they appear; and that ratooning of affected crops be discouraged.

The mosaic disease and Co. 281, C. W. EDGEWORTH. (La. Expt. Sta.). (*Sugar Bul.*, 19 (1941), No. 10, pp. 28-29).—A note on the seriousness of sugarcane mosaic on this variety, so widely grown in Louisiana, and on what may be done to control it. It is suggested that the problem of improving the variety and attempting to make all available seed stock reasonably free from mosaic be seriously attacked.

Phloem anatomy of tobacco affected with curly top and mosaic, K. ESAU (*Hilgardia* [California Sta.], 13 (1941), No. 8, pp. 435-490, pls. 18, figs. 7).—Degenerative changes in the phloem of curly top tobacco were found to be similar to those in affected sugar beet. In apexes of shoots and roots, degeneration usually occurs after the first sieve tubes differentiate and appears first in cells adjacent to them. Sometimes the differentiating sieve tubes themselves degenerate in root tips. The first degenerative changes are quickly followed by hyperplastic divisions resulting in numerous short sieve-tube elements. The hyperplastic tissue disintegrates, particularly in the primary phloem, and cavities are commonly formed where it degenerates. In recovering plants, phloem degeneration is comparatively mild but is usually present even if the organs show no external signs. The severity varies in different parts of the same organ and is sometimes not observed at all, but if present it almost invariably involves the production of supernumerary sieve tubes. External symptoms appear on the leaves most closely connected with the inoculated leaf by vascular tissue. These data confirm the concept that curly top is largely localized in the phloem. Tomato plants show the same degenerative changes, supernumerary sieve tubes being very conspicuous. With their larger phloem cells, tobacco and tomato are more favorable for studying the hyperplastic sieve tubes than sugar beet. The phloem of tobacco with mosaic contains inclusions typical of that disease, but apparently exhibits no other abnormalities.

Inclusions in guard cells of tobacco affected with mosaic, K. ESAU (*Hilgardia* [California Sta.], 13 (1941), No. 8, pp. 427-434, pls. 2).—The inclusion bodies characteristic of tobacco mosaic (x-bodies and striated material) were found in the guard cells of Turkish tobacco infected with Johnson's tobacco mosaic virus 1. The guard cells and adjacent epidermal cells are connected by plasmodesmata—structures serving as paths for virus entry into the guard cells.

On some reactions of tobacco mosaic virus, W. M. STANLEY (*Science*, 93 (1941), No. 2420, p. 463).—An abstract.

Recommendations for the control of wildfire and blackfire of dark tobacco, W. D. VALLEAU, E. M. JOHNSON, and E. J. KINNEY (*Ky. Agr. Col. Ext. A-12* (1940), pp. 4, fig. 1).

Note on staining nematodes in root tissue, C. W. McBETH, A. L. TAYLOR, and A. L. SMITH. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, p. 26).

Some factors affecting the virulence of artificial inoculum of *Helminthosporium sativum* P. K. and B. and of *Fusarium culmorum* (W. G. Sm.)

Sacc., L. E. TYNER (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. C, pp. 42-48).—Inoculum of either pathogen containing 12 percent corn meal caused more disease on wheat seedlings than that with 5 percent. *H. sativum* 14 days old was more virulent than after 21, 28, or 35 days' incubation, but there was no definite tendency with respect to age of culture for *F. culmorum*. Size of culture container proved unimportant if desiccation was avoided.

Notes on the life history of the root-knot nematode, *Heterodera marioni*, J. R. CHRISTIE and G. S. COBB. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 23-26, fig. 1).

On the identification of strains of *Heterodera schachtii*, M. T. FRANKLIN (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 63-84, fig. 1).—Infection experiments using possible host plants, though the final test of a strain, require careful handling and considerable time. In a limited number of such tests a strain on wild clover appeared distinct from the pea, oats, and beet strains, and a strain on *Myosotis* appeared distinct from the clover strain. Root excretions from host plants were unsuccessful in stimulating larval hatching from cysts of pea and oats strains, but potato strain larvae appeared to be stimulated by root excretions of several solanaceous plants. Of the strains measured, the oats strain larvae and those of *H. punctata* stood out as being considerably longer than the others. The potato strain is regarded as differing sufficiently to retain its status as a subspecies of *H. schachtii*.

Aphelenchoides megadorus, a new species of Tylenchoidea (Nematoda), M. W. ALLEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 21-23, fig. 1).—The new species described was rather common in 2 of 15 samples of soil near the roots of *Atriplex confertifolia*. Being forced to feed on the hard woody parts of desert plants has possibly influenced the development of the extreme specialization of the mouth parts observed.

A practical method of using methyl bromide as a nematocide in the field, A. L. TAYLOR and C. W. McBETH. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 26-28).—Methyl bromide proved effective against *Heterodera marioni* in sandy loam soil at 25° C. when applied by introduction under a gastight cover. Using a glue-coated kraft paper cover, 1.5 lb. completely controlled both root knot and free-living nematodes in 200 sq. ft. of field soil.

Fruit diseases in 1940, W. D. MILLS. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 86 (1941), pp. 53-62).—A seasonal summary relating to scab and other apple diseases, and diseases of pear, quince, stone fruits, and small fruits.

Apple fungicides, J. M. HAMILTON. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 86 (1941), pp. 44-53).—A summary of the development of apple fungicides, with special reference to scab control, and progress report on 1940 tests.

Bitter rot control under Delaware conditions, S. L. HOPPERSTEAD, K. J. KADOW, and M. W. GOODWIN. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans.*, 54 (1940), pp. 62-64).—A brief report on 3 years' spray tests indicating that a sufficiently high deposit of bordeaux mixture must be obtained early and maintained throughout the season, and that this build-up should start no later than the fourth cover. The "insoluble" coppers fail to give satisfactory control on susceptible varieties and in seasons favorable to infection by the pathogen *Glomerella cingulata*.

Relation of weather to prevalence of internal cork in apples, L. P. LATIMER. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc.*, 37 (1940), pp. 63-69, figs. 3; also [*New Hampshire Sta. Sci. Contrib.* 82 (1941)], pp. 63-69, figs. 3).—From the weather data analyzed it is believed that extended drought during June

and July constitutes a contributing atmospheric factor definitely responsible for the inability of the tree to obtain sufficient B for normal development of the fruit. This effect is intensified when drought conditions are continued from the earlier spring months. Furthermore, climatic factors other than spring and summer rainfall seem to have had slight, if any, influence on the prevalence or severity of internal cork in New Hampshire since 1926, and it does not appear that heavy rain following the summer drought is a factor in its development.

A brief review of research work at East Malling on the control of apple scab, M. H. MOORE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 27 (1939), pp. 75-76).

Observations on the maturation of the ascospores of the apple scab fungus in Indiana, R. C. BAINES. (*Ind. Expt. Sta.*). (*Hoosier Hort.*, 23 (1941), No. 3, pp. 40-41).

Ground spraying as an aid in the control of apple scab, K. J. KADOW and S. L. HOPPERSTEAD. (Univ. Del.). (*Peninsula Hort. Soc. [Del.] Trans.*, 54 (1940), pp. 64-72, figs. 2).—From the tests in five Delaware orchards reported, using two sodium dinitro-orthocresylate sprays and sodium nitrate plus calcium arsenite, it is concluded that ground spraying properly done will greatly reduce the primary inoculum and is justifiable as an extra scab control measure where scab was not satisfactorily controlled the preceding season, but that it is likely to fail unless followed with a well-timed thoroughly applied sulfur spray schedule.

Safer spray schedules for apples, H. J. MILLER. (Pa. State Col.). (*Pa. State Hort. Assoc. Proc.*, 82 (1941), pp. 82-84, 86-88).—A general discussion with special reference to scab control, including summaries of 1939 and 1940 tests and details of a three-part spray schedule (lime-sulfur before bloom, wettable sulfur or weaker lime-sulfur for petal fall and first cover, and weak bordeaux for the remaining cover sprays).

Physiological investigations on fall and winter pears in the Pacific Northwest, F. GERHARDT and B. D. EZELL (*U. S. Dept. Agr., Tech. Bul.* 759 (1941), pp. 67, figs. 28).—The results are presented of studies on the effects of maturity, handling, storage, ripening, and certain physiological disorders on the respiration, enzymes, carbohydrate, acetaldehyde, tannin, and pectic materials in five varieties of pears. Respiratory intensity was directly associated with maturity at harvest, scald, core break-down, and normal ripening at 65° F., whereas oxidase and catalase activity decreased with the approach of optimum maturity at harvest. Oxidase increased during storage at 30° and 36°, but the catalase changes were small. The activity of these enzymes was less in scalded than in normal pear tissues. No correlation was found between oxidase, catalase, and loss of normal ripening capacity in certain varieties. Carbohydrate analyses failed to indicate differences in fruit composition as influenced by scale, break-down, or loss of ripening capacity. Glucose, sucrose, and fructose represented the soluble sugars, with the last predominating. Acetaldehyde in pear tissues increased with storage time, rise in storage temperature, and degree of scald or break-down, but was not associated with loss of ripening capacity unless the above storage disorders were present. Tannin and nontannins were present in greater concentration in the skin than in other parts of the fruit. There was a significant correlation between degree of ripeness and amount of soluble pectin, the latter increasing tenfold during ripening to prime dessert quality. Loss of ripening capacity in Bosc and Comice pears was directly associated with failure of the hydrolytic mechanism responsible for the formation of soluble pectin. Studies of ripening demonstrated that for maximum storage life and op-

timum dessert quality pears should be stored at 80° immediately after harvesting. Under these conditions Comice and Flemish Beauty were ripened satisfactorily after 120-130 days, Bosc after 100-120 days, and Anjou and Winter Nellis after 180-200 days. Preventive and control measures are suggested for minimizing losses from pear scald, Anjou scald, core break-down, and loss of ripening capacity.

Quality of irrigation waters of the Hollister area of California, with special reference to boron content and its effect on apricots and prunes, F. M. EATON, R. D. McCALLUM, and M. S. MAYHUGH. (Coop. Univ. Calif.). (*U. S. Dept. Agr., Tech. Bul.* 746 (1941), pp. 60, pls. 5, maps 3).—In this irrigated valley certain of the ground waters were found to contain B concentrations sufficiently high to injure crops. Several hundred complete analyses are presented of surface and ground waters from this area and from that between San Francisco Bay and Santa Barbara. The location of a previously uncharted fault zone (parallel to the Hayward fault) extending across the Hollister area and into the hills to the south is mapped on the basis of the chemical data thus provided. In the soil solutions of the recent alluvial Yolo and Dublin soils, B was found to accumulate less rapidly than in old transported Montezuma and Rincon series. Stone fruits are shown to differ from other plants studied in that B is translocated from the leaves to the bark and from the bark to the fruit, where high concentrations occur. In other plants it accumulates principally in the leaves. The apricot fruit set was but little affected by B but vegetative growth was restricted, whereas French prunes failed to set a crop or to make a creditable vegetative growth. The reactions of other prunes were intermediate. The B accumulation in stone fruits caused bark-tissue break-down, gumming, and death of twigs. High concentrations were found in fruits with associated injury. The removal of fruit from apricot trees resulted in higher B concentrations in all other tissues.

Effects of zinc deficiency on cells of vegetative buds, H. S. REED. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 1, pp. 10-17, figs. 9).—In little-leaf of apricot and peach due to Zn deficiency, applying small amounts of Zn restored the activity of the hypoplastic cells, resulting in normal growth of vegetative shoots and leaves. The earliest indications of cellular derangements in apricot buds were shown by the strong affinity of certain meristematic cells for dyes, followed later by vacuolization and polarization. This hypoplastic condition was clearly evident in late winter before the buds had emerged from the resting stage. In peach the initial derangements took the form of vacuolization without such pronounced hyperchromatization of the meristematic cells. Following the cytopathology through four seasons, the effects of Zn deficiency appeared to be reflected in the condition of hypoplasia created, the polarization of cell contents, and the inhibition of cell multiplication in the apical region. The accentuated accumulation of phenolic substances in the vacuoles resulted in increased cell size and was never associated with necrosis. It is believed probable that certain phenolic compounds were utilized in metabolism.

Zinc as a corrective for little-leaf of peach in Florida, G. H. BLACKMON and R. D. DICKEY. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 46-49, pl. 1).—The data obtained indicate that this physiological disorder is a Zn deficiency. It was controlled by ZnSO₄ applied either to the soil or as a spray.

Virus disease of peaches (with special reference to X-disease), E. M. STODDARD. (Conn. [New Haven] Expt. Sta.). (*Pa. State Hort. Assoc. Proc.*, 82 (1941), pp. 88-93).—A summary of present knowledge, with special reference to X-disease.

Cherry leaf spot, R. H. DAINES (*New Jersey Stas. Cir.* 412 (1941), pp. [3], fig. 1).—An informational leaflet on *Coccomyces hiemalis* leaf spot and its control, revising Circular 191 (E. S. R., 55, p. 444).

The disease control situation with small fruits, R. F. SUIT. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 86 (1941), pp. 280-286).—A seasonal summary and progress report for New York State.

Progress in breeding for resistance to the red stele root disease of the strawberry in Maryland, W. F. JEFFERS, G. M. DARROW, and C. E. TEMPLE. (Univ. Md. and U. S. D. A.). (*Peninsula Hort. Soc. [Del.] Trans.*, 54 (1940), pp. 49-52).

Bacterial blight of vines (vlamsiekte) in South Africa caused by *Erwinia vitivora* (Bacc.) Du P., S. J. DU PLESSIS (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 214 (1940), pp. 105, pls. 14, figs. 3; *Afrikaans abs.*, pp. 85-87).—This monographic study concerns a blight of grapevines new to South Africa, having been first reported there in 1936 and found due to *E. vitivora* n. comb. (= *Bacillus vitivorus*).

The dying back of avocado trees in southern California, V. A. WAGER (*Calif. Avocado Assoc. Yearbook*, 1940, pp. 40-43, figs. 3).—A preliminary report on a decline of avocado trees associated with excessively wet soil and the presence of *Phytophthora cinnamomi*. It is believed that the wet condition enables the fungus to gain entrance into the roots and kill them.

Copper sulfate as a corrective for dieback, a new disease of the avocado, G. D. RUEHLE and S. J. LYNCH. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 152-154, pls. 5).—The new disease here described and hitherto observed only in groves on the light sandy soils of Highlands County, Fla., is believed to be a copper deficiency disease, since it was corrected by soil applications of CuSO_4 when the condition had not progressed too far. This study having been only exploratory in nature, detailed recommendations cannot at present be given.

Spraying experiments for control of avocado anthracnose, G. D. RUEHLE. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 155-158).—The disease was found to be controllable by bordeaux or red copper oxide sprays, and dormant sprays did not seem to be necessary. Scale insects increased more rapidly on the bordeaux-sprayed trees than on those sprayed with the red copper oxide or tribasic copper sulfate. The fungus *Colletotrichum gloeosporioides* also attacks mangoes, citrus, and papaya and is pathogenic on at least several other fruits.

Zinc deficiency of the avocado, G. D. RUEHLE. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 150-152).—From the experiments reported it is concluded that little-leaf of the avocado is a severe manifestation of Zn deficiency, and that it may be readily corrected by ZnSO_4 combined with lime as a spray.

Banana leaf spot *Mycosphaerella musicola*, the perfect stage of *Cercospora musae* Zimm., R. LEACH (*Trop. Agr. [Trinidad]*, 18 (1941), No. 5, pp. 91-95, pls. 2, figs. 3).—*M. musicola* n. sp. is described and demonstrated to be the perfect stage of *C. musae*. The intensity of spontaneous ascospore infection can be as heavy as that of conidial infection under certain conditions, and preliminary observations indicate that ascospore discharge is seasonal.

Swollen-shoot virus disease of cacao, A. F. POSNETTE (*Trop. Agr. [Trinidad]*, 18 (1941), No. 5, pp. 87-90, fig. 1).—A review and progress report on investigations of this disease to November 1940, including early diagnosis, transmission by budding, by seed, and by the cacao psyllid, but negative results with several other insects and with artificial inoculations. It appears to be one of the most serious diseases of cacao thus far known.

The status of the melanose fungus in cold injured citrus wood, R. K. VOORHEES (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 61-64).—Following some freezes in the past there has been a tremendous development of the melanose fungus in the cold-injured wood and a subsequent release of spores before April 1 and in some cases even a month earlier. Observations on the present situation are discussed briefly.

An ascomycete (*Glomerella* sp.) observed on orange in Guarujá, Brazil [trans. title], R. AVERNA SACCA (*Rev. Agr. [Brasil]*, 15 (1940), No. 11-12, pp. 463-467, pl. 1, figs. 2).

Black spot of orange due to *Phoma citricarpa* [trans. title], R. AVERNA SACCA (*Rev. Agr. [Brasil]*, 15 (1940), No. 11-12, pp. 468-474, pl. 1, figs. 3).

Brown rot and gummosis, L. J. KLOTZ and H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 5, pp. 114, 142-143, figs. 2).—A report of progress in studies of these two fungus diseases of citrus and their control, including the testing of various rootstocks for resistance to gummosis.

The effect of zinc, iron, manganese and magnesium applied to frenched and bronzed orange groves, on the vitamin C content of oranges, W. R. ROY and G. M. BAHET. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 34-38).—Oranges from frenched or bronzed trees yielded juice with sub-normal amounts of ascorbic acid, but following restoration of the Zn and Mg deficiencies, respectively, the content after an interval was restored to what might be considered a normal level. On the other hand, soil applications of Zn and Mg to groves not exhibiting these deficiency symptoms failed to cause any significant increase in ascorbic acid content.

Granulation of Valencia oranges, E. T. BARTHOLOMEW, W. B. SINCLAIR, and F. M. TURRELL (*California Sta. Bul.* 647 (1941), pp. 63, pls. 4, figs. 5).—Though granulation has been reported and described from nine other countries and probably occurs in one or more varieties wherever citrus is grown, only the Valencia orange is commercially affected in California. There it is more prevalent on the Coastal Plain, the fruit is more subject to it on young than on old trees, and its commercial importance usually does not become apparent until after the middle of the picking season. Granulation originates in and is ordinarily confined to the stem half of the fruit. Though the juice sacs enlarge with granulation, there is no consistent enlargement of the stem end. Spraying the trees with lime appeared to reduce the granulation in proportion to the concentration used, but is not recommended because of its adverse effect on the trees. Certain trees possess a strong tendency toward either much or little granulation from year to year, and the basis of this tendency is being investigated. The juice sacs usually enlarge and become comparatively hard during early stages of granulation but later soften and collapse. This increase in juice sac size is due to cell enlargement rather than multiplication, and the hardening follows gelatinization of the cell contents and lignification of the walls in some of the internal cells. In the intermediate stages of granulation, gas forms and is temporarily trapped within the hard-walled cells, later escaping into the newly formed intercellular spaces and finally into the cavity formed by cellular degeneration. Concentration of carotene in the juice sacs decreases with granulation.

The actual cause of granulation has not been definitely determined and control measures are limited, but some of the possible causes and corrective measures are discussed. Many possible direct or indirect causes and associated factors were investigated, including soil moisture relations, rootstocks, temperature, limb girdling, fruit size, position on the tree, composition, acidity, etc. The apparent inconsistencies in some of the results and the exceptions to experi-

mentally proved trends are believed to indicate that a comparatively large number of factors are concerned. Extensive laboratory studies have shown that many changes occur in the juice sacs during granulation, as a result of which it is not surprising that the taste and edibility are greatly modified. This work refers to typical granulation and not to "dry juice sac," which the authors here suggest as a suitable descriptive term for the physiological disorder in the past referred to as "blossom-end granulation."

Studies in the diseases of *Mangifera indica* Linn.—II, Effect of injecting healthy mango fruits with extract from naturally occurring necrotic mangoes. S. N. DAS GUPTA and G. S. VERMA (*Indian Acad. Sci. Proc.*, 12 (1940), No. 4, Sect. B, pp. 95–108, pl. 1, fig. 1).—The symptoms of necrosis induced experimentally by injection of mango fruits on the tree are described and compared with the spontaneously occurring disease. About 38 percent of the inoculated fruits developed the necrosis.

Little-leaf of mangos: A zinc deficiency. S. J. LYNCH and G. D. RUEHLE. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 167–169, pls. 2).—Spray applications of ZnSO₄ and lime to the foliage corrected the condition.

Characteristics of coliform bacteria from olives. N. S. WEST, J. R. GILL-LAND, and R. H. VAUGHN. (Univ. Calif.). (*Jour. Bact.*, 41 (1941), No. 3, pp. 341–352, pl. 1).—The genus *Aerobacter* represented 70.5 percent of the cultures isolated, "intermediate" forms constituting the remainder. No true *Escherichia* cultures were found.

Walnut blight control in Oregon. P. W. MILLER. (U. S. D. A.). (*Oreg. State Col. Ext. Cir.* 359 (1941), pp. [1] + 3, pl. 1).

Leaf spot of derris. P. R. SANTOS (*Philippine Agr.*, 29 (1941), No. 8, pp. 641–659, figs. 6).—The cause of this most widespread disease of derris, prevalent in various parts of the Philippines, was identified as *Phyllosticta derriidis*. It does not kill the plants but is believed to reduce greatly the synthesizing efficiency of the leaves. The history, distribution, economic importance, and symptoms are discussed, and details regarding the fungus and its pathogenicity are presented.

Mosaic? C. L. PIESSE (*Gladiolus* [*New England Gladiolus Soc.*], 1941, pp. 114–117).—A general discussion (with comments by others) as to whether gladiolus is subject to mosaic infection.

The season's No. 1 gladiolus disease—mosaic. A. W. DIMOCK (*Gladiolus* [*New England Gladiolus Soc.*], 1941, pp. 117–123).—A general discussion on the current prevalence of mosaic on gladiolus in the northeastern United States, with brief historical notes and suggested precautionary control measures.

The "smnt" disease of gladiolus. B. O. DODGE and T. LASKARIS (*Science*, 93 (1941), No. 2405, p. 111).—This is a preliminary note on a fungus, first thought to be *Urocystis gladioli*, found associated with a core rot of gladiolus corms, not yet definitely identified but found to possess features not characteristic of smut fungi.

Immortelle disease. R. E. D. BAKER (*Trop. Agr. [Trinidad]*, 18 (1941), No. 5, pp. 96–101, figs. 2).—The distribution, hosts, and symptoms of a disease of immortal trees (*Erythrina* spp.) in Trinidad found due to *Calostilbe striispora* are presented. Possible control measures, including the regular replanting of shade trees, are suggested.

Nematodes parasitic on and associated with roots of marigolds (*Tagetes* hybrids). G. STEINER (*Biol. Soc. Wash. Proc.*, 54 (1941), pp. 31–34, pl. 1).

The control of narcissus leaf diseases.—II, The effect of white mould on flower and bulb crop. P. H. GREGORY (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 472–488, pls. 2, figs. 7).—Preliminary spray trials⁴ indicated the magnitude of

⁴ Ann. Appl. Biol., 27 (1940), No. 3, pp. 338–347.

indirect losses of narcissus flower and bulb crops from leaf diseases, and the increases obtainable when white mold (*Ramularia vallisumbrosae*) and fire (*Sclerotinia polyblastis*) are controlled by Cu sprays. The present study indicates the effects of attacks of white mold on bulb increase and flower crop over a period of years in a climate favorable to its spread. After 3 yr. the bulb yield from sprayed plats was 80 percent heavier than that from unsprayed controls, the increase consisting principally in a greater average bulb weight of the double-nosed and mother bulbs. Flowers from sprayed plats were better in quality, and in 1939 were significantly heavier than those from control plats.

Ring spot of popular Peperomias caused by virus, D. B. CREAGER (*Florists' Rev.*, 87 (1941), No. 2256, pp. 15-16, figs. 2).—A summary of studies indicating ring spot of this plant to be due to a virus.

Rhododendrons injured by freak weather, P. P. PIRONE (N. J. Expt. Stas.). (*Florists' Eech. and Hort. Trade World*, 96 (1941), No. 18, p. 12).—Wilting of rhododendrons over a considerable area in northern New Jersey is ascribed to dry winds of high velocity after mid-March followed by unusually mild temperatures at a time when the ground was still frozen. The importance of placing these plants in unexposed sites is stressed.

Rose diseases and effectiveness of new spray materials, E. W. LYLE (Tex. Expt. Sta.). (*South. Florist and Nurseryman*, 50 (1941), No. 20, pp. 3-5, 22).—A review of recent findings, with special reference to sprays and dusts and disease-resistant varieties.

Dormant black-spot control? L. M. MASSEY. [New York] Cornell Expt. Sta.). (*Amer. Rose Mag.*, 4 (1941), No. 1, pp. 3-4).—A note on promising results in control of rose black spot by use of a new spray material, sodium dinitro-orthocresylate.

Texas black-spot control work, E. W. LYLE (Tex. Expt. Sta.). (*Amer. Rose Ann.*, 1941, pp. 172-175).—The latest development from the experiments on roses under Texas conditions reported is a S-Cu dust made up of 325-mesh S with one of the "insoluble" Cu compounds. Results with other materials are also presented.

Die-back of roses, E. W. LYLE and L. M. MASSEY. (Tex. Expt. Sta. and Cornell Univ.). (*Amer. Rose Ann.*, 1941, pp. 176-179, figs. 3).—Dieback of roses is presented as a symptom complex rather than as a specific disease. It may be due to various causes, environal or pathogenic, many briefly discussed or noted.

Pedical necrosis of the rose, A. E. JENKINS and P. E. TILFORD. (U. S. D. A. and Ohio Expt. Sta.). (*Amer. Rose Ann.*, 1941, pp. 180-181).—This is a preliminary note on an obscure rose trouble apparently not hitherto reported and which does not appear to be of fungus origin. The necrosis is associated, if not directly connected, with a bending of the pedicel and a consequent drooping of the bloom. which does not wilt quickly but usually withers slowly, remaining about half open for several days before the petals fall.

Tulip anthracnose, C. M. TOMPKINS and H. N. HANSEN. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 1, pp. 61-64, figs. 3).—Tulip anthracnose is reported at Burlingame, Calif., with symptoms consisting of elliptical lesions, first water-soaked but later becoming dry and covered with fruiting bodies. Infection of the Rev. H. Ewbank and Zwanenburg varieties was readily obtained by atomizing the plants with an aqueous spore suspension, but Clara Butt and Fantasy varieties were apparently immune in both field and greenhouse. The pathogen is named *Gloeosporium thumensei tulipae* n. f.

Important tree pests of the Northeast, edited by H. I. BALDWIN ET AL. (Boston: Mass. Forest and Park Assoc., 1940, pp. 195, figs. 75).—This illustrated

compendium comprises revisions of Tree Pest Leaflets Nos. 1-50 combined in book form.

Diseases of shrubs and small trees, P. P. PRONE (N. J. Expt. Stas.). (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 91-112, figs. 9).—A general compendium on the diseases and their control.

A new smut from Louisiana, L. W. LENZ. (La. State Univ.). (*Mycologia*, 33 (1941), No. 2, pp. 155-157, figs. 2).—*Tilletia euphorbiae* n. sp. parasitizing *Euphorbia heterophylla*.

Nature and control of shade tree chlorosis in Lansing, Michigan, K. K. KREAG (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 32-38).—The author points out that this chlorosis seems to be a growing problem in the area, that excessive surface drainage from pavements and packed highways appears to be the major cause for this increase, that spraying with an iron sulfate solution in some cases and with a manganese sulfate solution in others has given promise of seasonal control, and that soil treatment—the only method from which lasting results may be expected—still needs much further study.

Diseases of oaks and Verticillium wilt of woody plants, J. C. CARTER (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 83-91, figs. 3).—In addition to listing unfavorable environal factors, the author discusses the twig, branch, and trunk diseases due to fungi which definitely contribute to the failure of oak trees to survive and the wilt diseases of woody plants due to *V. albo-atrum*, including notes on some *Verticillium*-infected oaks.

An important powdery mildew disease of the coast live oak, P. A. MILLER (Univ. Calif.). (6. *West. Shade Tree Conf.*, Oakland, 1939, *Proc. Ann. Mtg.*, pp. 32-36).—In the coastal regions of California, *Quercus agrifolia*, extensively used in ornamental plantings, is commonly attacked by *Sphaerotheca lanestris*. This is a preliminary report of some observations on the disease and on its control.

The genus *Taphrina*.—I, An annotated bibliography; II, A list of valid species, A. J. MIX (*Kans. Univ. Sci. Bul.*, 24 (1936), Nos. 9, pp. 113-149; 10, pp. 151-176).

Errata in two recent papers on *Taphrina*, A. J. MIX (*Kans. Univ. Sci. Bul.*, 26 (1939), No. 6, pp. 355-356).—See above.

Morphological differences in *Taphrina caerulescens* upon different species of *Quercus*, E. O. THOMPSON (*Kans. Univ. Sci. Bul.*, 26 (1939), No. 7, pp. 357-366, pls. 2).

The morphology and cytology of *Taphrina deformans*, E. M. MARTIN. (Univ. Wis.). (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 743-751, figs. 49).

Prediction of cull following fire in Appalachian oaks, G. H. HEPTING. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 2, pp. 109-120, figs. 5).—The cull resulting from invasion of basal fire wounds by wood-rotting fungi was satisfactorily predicted from the width and age of wounds, but no significant difference in amount of cull among species with like basal wounds was found among different sites or study areas. Much of the variation in cull among trees with like basal wounds is ascribed to the fungus species involved. Of the 16 species of rot fungi isolated from decay following wounds, the most common were *Stereum frustulosum* and *Hydnum erinaceus*.

The distribution and association of *Gonatorrhodiella highlei* with *Nectria coccinea* in the United States, T. T. AYERS. (U. S. D. A. et al.). (*Mycologia*, 33 (1941), No. 2, pp. 178-187, fig. 1).—This fungus, originally collected in England on onion bulbs and here reported for the first time in the United States, is of particular interest because of its unusual morphology and its association with *N. coccinea*, which, together with *Cryptococcus fagi*, is con-

cerned with the beech bark disease of native beech in New England. Its morphological and cultural characters are discussed.

Germination reduction and radicle decay of conifers caused by certain fungi, P. L. FISHER. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 2, pp. 87-95).—Isolates from the interior of surface sterilized fresh and stratified seed and seed from nursery beds in which germination had failed yielded organisms in sufficient numbers to explain at least spotty decay, which frequently occurs in coniferous nursery beds where damping-off fungi are not appreciably active. Bacteria and *Fusarium* spp. were isolated most frequently. Surface sterilized seeds of *Pinus banksiana*, *P. ponderosa*, and *P. resinosa* were inoculated with certain cultured fungi and maintained at rather low temperatures. There was no significant difference in the susceptibility of the hosts under the test conditions, and there was a general decreased germination in the inoculated units which was greater than in earlier published tests conducted at room temperatures. *Botrytis* (*cinerea*?), *Fusarium* spp., an unidentified phycomycete, *Pythium debaryanum*, *P. ultimum*, *Rhizoctonia*, *Sphaeropsis ellisii*, *Verticillium*, and four unidentified fungi caused decay of radicles just emerged from the seed coats.

Cenangium abietis, Brunchorstia destruens, and Crumenula abietina, P. R. BOWEN (*Pa. Acad. Sci. Proc.*, 14 (1940), pp. 95-99).—It is concluded from this study that the two first fungi are not parasitic to young trees of *Pinus sylvestris*, *P. strobus*, or *P. resinosa* in the United States; that they are two distinct species; and that *B. destruens* is the conidial stage of *C. abietina*.

The sampling of Ribes populations in blister rust control work, T. H. HARRIS. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 316-323, fig. 1).—The method of sampling is described for use in blister rust work to obtain information on the numbers and distribution of currants and gooseberries as a basis for control operations in the sugar pine forests of California and southern Oregon. Information on the personnel and administrative end of the work is also given.

Ribes petiolare Dougl. in California, J. L. MUELKE. (U. S. D. A.). (*Madroño*, 6 (1941), No. 1, pp. 30-31).—The occurrence of *R. petiolare* is considered significant from the standpoint of blister rust control, it being one of the most susceptible of western currants and growing in dense concentrations associated with whitebark pine (*Pinus albicaulis*).

The application of surgery to blister rust infected trees of ornamental value, J. F. MARTIN. (U. S. D. A.). (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 113-120).

Observations and experiments on Diplodia die-back of pines at Canberra, A. C. T., W. V. LUDBROOK and N. H. WHITE (*Jour. Council Sci. and Indus. Res.* [Austral.], 13 (1940), No. 3, pp. 191-194).—The experiments and observations reported appear to indicate that under Canberra conditions *D. pinea* is unlikely to cause serious injury to the six species of pine studied, unless there are predisposing factors.

Boron deficiency symptoms on pine seedlings in water culture, W. V. LUDBROOK (*Jour. Council Sci. and Indus. Res.* [Austral.], 13 (1940), No. 3, pp. 186-190).—The symptoms of B deficiency in *Pinus radiata* and *P. taeda* grown in nutrient solutions are described.

Preliminary observations on the aecial hosts of Melampsorella, S. M. PADY (*Kans. Acad. Sci. Trans.*, 43 (1940), pp. 147-153, figs. 5).—Includes descriptive and tabular comparisons of the differences in witches'-brooms, pycnia, and aecia of this rust genus as it occurs on its two aecial hosts, *Picea* and *Abies*.

Penetration of the walls of wood cells by the hyphae of wood-destroying fungi, P. PROCTOR, JR. (*Yale Univ. School Forestry Bul.* 47 (1941), pp. [4]+31, pls. 22).—From the evidence presented it is concluded that penetration is accomplished by secretion of enzymes at the tips of the invading hyphae and by total local dissolution of the cell wall by enzymic activity in advance of actual passage through the cell wall. In the cases of penetration observed, the hyphal tip was preceded by a cavity of significant proportions, as shown in the photomicrographs.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The need for research in fur animal production, F. G. ASHBROOK (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 139-140).

A method for estimating the red fox population, T. G. SCOTT. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 2, pp. 155-159).

The rabbits of California, R. T. ORR. (Univ. Calif. et al.). (*Calif. Acad. Sci., Occas. Papers*, 19 (1940), pp. [5]+227, pls. 10, figs. 30).—Reporting upon the classification and biology of the rabbits of California, seven species are recognized, three of which represent the genus *Lepus*, namely, *L. townsendii*, *L. californicus*, and *L. washingtonii*, and four the genus *Sylvilagus*, namely, *S. nuttallii*, *S. audubonii*, *S. bachmani*, and *S. idahoensis*. A six-page list of references to the literature cited is included.

Food habits of the eastern and New England cottontails, P. D. DALKE and P. R. SIME. (Univ. Conn. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 216-228, figs. 2).

Production of pheasants in north-central Iowa in 1939, T. S. BASKETT. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 168-174).

Hatchability of pheasant eggs in relation to some known temperatures, P. F. ENGLISH. (Pa. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 213-215).

Some plants valuable to quail in southwestern Texas, V. W. LEHMANN and H. WARD (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 131-135, fig. 1).

Hemoglobin regeneration in anemic trout fed liver fractions and fly maggots, A. M. PHILLIPS and C. M. McCAY. (Cornell Univ.). (*Science*, 93 (1941), No. 2415, pp. 355-356).

Snail control in orchards, H. C. LEWIS and J. R. LAFOLLETTE (*Calif. Citrog.*, 26 (1941), No. 5, pp. 117, 132, figs. 2).—This is a discussion with directions for the use of poison baits which are the best treatment available in combating the common brown snail, a pest of considerable importance in many citrus groves, particularly in the coastal areas where temperatures are moderate and humidity high.

Observations on the possible effects of arthropod parasites on wildlife in western Canada, G. A. MAIL and J. D. GREGSON (*Internatl. Assoc. Game. Fish. and Conserv. Commrs. Conv., Toronto, Proc.*, 34 (1940), pp. 126-132).

A contribution to the knowledge of the helminth fauna of Minas Geraes [trans. title], J. C. M. CARVALHO (*Ceres [Minas Geraes]*, 1 (1940), No. 5, pp. 411-423; *Eng. abs.*, p. 423).—An annotated list is given of the helminths of domestic and wild animals of Minas Geraes, Brazil, with the incidence and degree of infestation.

Helminths of muskrats in southeast Texas, A. C. CHANDLER (*Jour. Parasitol.*, 27 (1941), No. 2, pp. 175-181, figs. 4).—Three species of trematodes, four of nematodes, and no cestodes were found infesting 36 muskrats collected in southeast Texas. One trematode, *Phagicola lageniformis*, is new. Of the nematodes, *Rictularia omdatrae* is new, *Strongyloides ratti omdatrae* is a new variety, and *Litomosoides carinii* is a new host record.

[Contributions on economic insects] (*Peninsula Hort. Soc. [Del.] Trans.*, 54 (1940), pp. 17-24, 30-35, 103-104, 110-119, figs. 7).—Among the station contributions relating to field and truck crop insects presented at the annual meeting of the Peninsula Horticultural Society, held in December 1940, are the following: Results of a Nine Year Study of Potato Flea-Beetle Control in Eastern Virginia, by L. D. Anderson and H. G. Walker (pp. 17-24), early work with which has been noted (*E. S. R.*, 71, p. 76), and Results of Tests for the Control of the Pea Aphid in Eastern Virginia, by H. G. Walker and L. D. Anderson (pp. 30-35) (*E. S. R.*, 84, p. 80) (both Va. Truck Expt. Sta.); New Developments in Insect Damage in Maryland, by E. N. Cory (pp. 103-104) (Md.); and European Corn Borer in Delaware, by L. A. Stearns (pp. 110-119) (Del.) As a result of the experiments with the potato flea beetle a calcium arsenate-bordeaux (2-4-6-50) spray mixture is recommended for the control of this pest in Accomac County, Va. "This mixture should be applied at the rate of 100 gal. to the acre with a sprayer that has three nozzles to the row and one that will maintain at least 250 lb. of pressure to the square inch. From five to seven applications of spray should be made at 7- to 10-day intervals beginning between May 1 and 15 depending on seasonal developments. Particular precautions should be taken to time these applications so that the plants are thoroughly covered with this material when the new brood of beetles appear between June 15 and 25. Also, the nozzles should be adjusted to thoroughly spray the under sides of the leaves where the beetles do most of their feeding. Although spraying with a calcium arsenate-bordeaux material increased the yield nearly twice as much as dusting with a calcium arsenate-monohydrated copper sulfate-hydrated lime (25-20-55) mixture, nevertheless this dust gave profitable returns and its use is recommended when spraying is impracticable."

Insect pests, W. C. HARVEY and H. HILL (*London: H. K. Lewis & Co., 1940, pp. IX+292, figs. 23*).—The first part of this work consists of a practical account of insect pests, largely those annoying man, the second part being devoted to principles and practice of disinfestation of buildings, foodstuffs, ships, etc.

Some recent works on the classification of immature insects, W. P. HAYES. (*Univ. Ill.*). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 1, pp. 3-11).—This contribution is presented with a four-page list of references to the literature cited.

Progress report in pest control, 1940, W. J. O'NEILL. (*Wash. Expt. Sta.*). (*Wash. State Hort. Assoc. Proc.*, 36 (1940), pp. 11-17).

[Contributions on fruit insects] (*N. Y. State Hort. Soc. Proc.*, 86 (1941), pp. 7-44, 211-222, 305-335, figs. 5).—Among contributions on fruit insects and their control presented at meetings of the New York State Horticultural Society, held in January 1941, are the following: Fruit Insect Problems in 1940, by J. A. Evans (pp. 7-29, 211-213) (Cornell Univ.); The Early Season Spray Program, by F. Z. Hartzell (pp. 30-37), and The Summer Spray Program, by S. W. Harmon (pp. 38-42) (both N. Y. State Expt. Sta.); Oriental Fruit Moth, by D. M. Daniel (pp. 42-44); New Facts About Oil Sprays, by P. J. Chapman (pp. 213-217), and The European Red Mite, by R. W. Dean (pp. 218-222) (both N. Y. State Sta.); The Codling Moth and Apple Maggot in Relation to the Hudson Valley Apple Market, by F. P. Hart (pp. 305-309); The Place of Pruning in Codling Moth Control, by L. C. Anderson (pp. 309-313); Orchard Sanitation and Measures Supplementary to Spraying for Codling Moth Control, by D. W. Hamilton (pp. 313-318) (U. S. D. A. coop. N. Y. State Sta.); Field Tests for Codling Moth and Apple Maggot Control and the Implications of the New Residue Tolerances, by O. H. Hammer (pp. 318-326); A New Kind of Codling Moth Control, by A. Van Alstyne (pp. 328-330); and The Codling Moth Fight From the Growers' Standpoint, by L. Howard (pp. 330-335).

Recent developments in fruit-insect problems, B. A. PORTER. (U. S. D. A.). (*Pa. State Hort. Assoc. Proc.*, 82 (1941), pp. 57-58, 60-67).

Recent research work with fruit insects, H. N. WORTHELEY. (Pa. State Col.). (*Pa. State Hort. Assoc. Proc.*, 82 (1941), pp. 72-79).

Insect pests of stored grain and grain products: Identification, habits, and methods of control, R. T. COTTON (*Minneapolis, Minn.: Burgess Pub. Co.*, [1941], pp. [3]+242, figs. 93).—This compendium is presented in 11 chapters, all but one of which include references to the literature cited.

Insect infestation in railway box cars in which wheat has been shipped, T. F. WINBURN. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 1, pp. 22-25).

Field infestation of wheat by insects attacking it in farm storage, R. T. COTTON and T. F. WINBURN. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 1, pp. 12-16).

Factors affecting the toxicity of red squill, J. A. LUBITZ, A. S. LEVINE, and C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Amer. Pharm. Assoc.*, 30 (1941), No. 3, pp. 69-72).—In an investigation aimed at making red squill more effective as a rat poison, the factors studied included the effect of sex of rats, heat, moisture, fat, pectin, and diet on its toxicity. Found to be half as toxic for males as for female rats, it is recommended that standard assays of red squill be based on male rats rather than female rats or rats of mixed sexes. The higher the dry air temperature (above 100° C.) applied to red squill powder, the less toxic it becomes. The amount of moisture in a red squill bait has little relationship to its toxicity. Large percentages of protein (casein) or carbohydrate (cornstarch) in squill baits do not affect their toxicity, but considerable fat results in a slight decrease in the toxicity, and the more pectin in a red squill bait, the less toxic will it be to rats. Low protein diets containing (1) high fat and (2) high carbohydrate when fed to rats for 30 days seem to have no marked effect on the toxicity of red squill, but a high protein (casein), low carbohydrate (cornstarch) diet rather definitely decreases the toxicity.

A method for obtaining spores of the fungus *Beauveria bassiana* (Bals.) Vuill. in quantity, E. E. MCCOY and C. W. CARVER (*Jour. N. Y. Ent. Soc.*, 49 (1941), No. 2, pp. 205-210, fig. 1).

A field method for estimating Mormon cricket injury to forage, R. B. SWAIN. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 4, pp. 124-127).

Citrus thrips control: Present recommendations for the use of tartar emetic, C. O. PERSING and A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 5, pp. 118, 144-145, fig. 1).

Dipping of strawberry runners before planting, A. M. MASSEE and R. M. GREENSLADE (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 27 (1939), pp. 73-74).—In order to determine the injury of strawberry plants ascribed to soft soap used in sprays against the strawberry aphid, plants were immersed in solutions of commercial soft soap and of soap prepared from oleic acid and caustic soda, both containing nicotine. No permanent injury resulted from concentrations up to 0.8 percent of soap, which is double that normally recommended.

Studies on the feeding methods and penetration rates of *Myzus persicae* Sulz., *Myzus circumflexus* Buckt., and *Macrosiphum gei* Koch, F. M. ROBERTS (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 348-358, pls. 2).—Report is made of the feeding habits and penetration rates of the green peach aphid, *Myzus circumflexus*, and the potato aphid on tobacco and of the green peach aphid on sugar beet in relation to their transmission of *Hyaloscyamus* virus III, potato virus Y, cucumber virus I, and sugar beet yellows virus. Neither the green peach

aphid nor *M. circumflexus* was found to reach the phloem after 5 min. feeding on tobacco. Very few green peach aphids penetrated the phloem in 15 min. on tobacco or sugar beet. Even after 24 hr. a few aphids do not penetrate the phloem but feed on nonvascular tissue. The green peach aphid and the potato aphid were found to penetrate by the intracellular method in more than 50 percent of the slides examined and *M. circumflexus* in less than 50 percent. The potato aphid showed a higher percentage of phloem penetrations in from 1 to 24 hr. than the other aphids. There were no visible toxic effects on the part of the host plants to the insects' saliva with either tobacco or sugar beet. A possible correlation between the behavior of the green peach aphid and *M. circumflexus* with cucumber virus I and localization of this virus in the leaf is discussed. Increased infections with increased feeding times on both infected and healthy plants in the transmission of sugar beet yellows virus by its vector, the green peach aphid, is discussed in relation to phloem feeding.

Aphis migration: An analysis of the results of five seasons' trapping in North Wales, I. THOMAS and E. J. VEVAT (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 393-405, figs. 5).—Report is made of aphids collected in mechanical insect traps operated by water power in North Wales for five consecutive summers. Seventy-six species were identified and their incidence as correlated with meteorological conditions was studied. The more important synonyms of some aphids of economic importance are tabulated.

The feeding habits of certain leafhoppers, W. L. PUTMAN (*Canad. Ent.*, 73 (1941), No. 3, pp. 39-53, figs. 8).—Observations of the feeding habits of the white apple leafhopper, potato leafhopper, plum leafhopper, and *Macropsis insignis* (Van Duzee) are reported.

Moth proofing test (*Soap and Sanit. Chem.*, 16 (1940), No. 10, p. 97).—The details of a tentative method for testing the resistance to moths of fabrics which contain wool or other hair fibers are presented.

Factors influencing the abundance and size of *Psychoda* species in sewage bacteria beds, W. H. GOLIGHTLY (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 406-421, fig. 1).

A species of mosquito infesting deep shelters in London, P. G. SHUTE (*Lancet* [London], 1941, I, No. 1, pp. 6-7).—Record is made of the breeding throughout the year of the annoying *Culex molestus* in water in the excavations beneath platforms at various subway stations that serve as deep shelters in London. Its control is readily brought about by the application of oil.

Mosquitoes infesting deep shelters, J. F. MARSHALL (*Lancet* [London], 1941, I, No. 4, p. 127).—Reference is made to *Culex molestus*, first discovered in Great Britain in 1934, and previously overlooked because both the larval and adult forms of this mosquito and the northern house mosquito resemble one another so closely. The two species differ, however, in important respects. *C. molestus* is one of the worst biters encountered, whereas customary victims of the northern house mosquito are birds and it rarely if ever attacks human beings. Moreover, *C. molestus* is both stenogamous and autogenous, that is, the adults will mate in a very small space (even in a test tube) and the fertilized females are able to lay some eggs (about 70) without having had a preliminary meal of blood. Of the 2,000 odd species of mosquitoes known in the world only 2 besides *C. molestus* have so far been found to be autogenous, namely, the British species *Theobaldia subochrea* and the Australian species *Aedes concolor*. Combining as it does the characteristics of stenogamy and autogeny, *C. molestus* is extremely easy to breed in small laboratory jars all the year round. Its infestation of deep shelters in London is noted.

A physiological study of mosquito larvae which were treated with anti-malarial oils, G. I. WATSON (*Bul. Ent. Res.*, 31 (1941), No. 4, pp. 319-330).—The results of an investigation aimed at determining the effect of oils and of water treated with oil on the behavior of mosquito larvae are reported. It is shown not only that a larva after contact with an oil may meet its death in several ways, but also that in certain circumstances it may, after being oiled, escape death by molting its skin. A table is given showing the many physiological functions of an anopheline larva which may be disturbed by the action of an oil and the manner in which some of the larvae may die. After external contact alone between oil and a larva's body any of the following results may be seen: First, oil may adhere to the larva's hairs and interfere with the insect's normal position of balance; such a larva may drown by sticking upside down at the surface though it has air in both tracheae. Secondly, the normal movements of the larva's feeding brushes may be obstructed by adherent oil globules so that some larvae are unable to feed and may die of starvation; others may succeed in freeing their brushes either before or as a result of molting their skins. Thirdly, oil may poison the larva from outside without any entering its tracheae. Certain oils are directly poisonous to a mosquito larva, appearing to act on its muscular tissues, causing convulsions and then paralysis. All the poisons examined, whether volatile or not, were found to be soluble in water and able to penetrate the outer cuticle of a larva's body. The process of refining kerosenes for use as smokeless fuel is shown to remove from them at least some of the substances which make untreated kerosenes highly toxic to anopheline larvae. The necessity therefore is to know that a kerosene is toxic before adding any to an antimalarial mixture with the intention of raising its efficiency. No larva, either culicine or anopheline, in which both tracheae were quite full of any oil has been seen to molt or pupate. Some larvae, however, have been seen in which oil had entered and filled only part of one or of both tracheae. A table of experimental results is given, which shows that a difference between two oils in the width of their initial spread on water represents to a larva in that water a difference in its chances of being oiled. It would appear that oil in the form of an emulsion may have both advantages and disadvantages over oil applied as a surface film. The advantages are seen when a toxic oil is applied in very small quantities as an emulsion to stretches of shallow standing water. Here the poisons, being water soluble, have a chance of acting on the larvae, their food supply, and their vegetable shelters, for a longer time than if the water were flowing. The antimalarial aspects of these differences between oils have been reviewed, and the possibility is suggested of using such differences to suit particular local problems of mosquito control. The time available in which to kill mosquito larvae is the time until they next molt their skins. If, before this happens, enough oil enters their tracheae to obstruct molting or to poison or suffocate them, or if their skeletal muscles are paralyzed even by a momentary contact with oil, or if their feeding brushes are matted or their food supply poisoned so that they starve to death, then the oil mixture and the method of applying it have been successful.

The history and biology of the juniper midge *Contarinia juniperina* Felt, L. HASEMAN and S. R. McLANE. (Univ. Mo.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 4, pp. 612-615, pl. 1).—An account is given of the life history and natural enemies of *C. juniperina*, a pest which has caused an unusual amount of dead tip growth of red cedars in and about Kansas City, Mo., where it first came to attention in 1936. It has since been found widely distributed over the State and to occur in Kansas, Nebraska, and Kentucky. Its attacks are most severe on the common red cedar with its horticultural varieties *cannarti*, *schottii*, and

glauca, and the *scopulorum* junipers. Greek junipers, Andorra, and Savin are attacked to a less degree, and thus far it has been found only on junipers. There is a single generation a year, the larva requiring from May to October or later to become full-fed, when they may drop from the twigs in showers, going into the ground for the winter. From one to five larvae occur in a twig. The hymenopterous parasite *Platygaster pini* Fouts, which attacks the larvae in the soil in the spring just before they pupate, is the one effective natural check.

Black-flies bite woodchuck, H. S. FULLER (*Bul. Brooklyn Ent. Soc.*, 35 (1940), No. 5, p. 155).—The attack of the woodchuck by *Simulium parnassum* Malloch is recorded for the first time.

Intravenous injections of arsenic ineffective in controlling horn flies on cattle, W. G. BRUCE (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 4, pp. 128-129).

The moisture balance of the living fleece in relation to blowfly myiasis, with some remarks on the Australian and British conceptions of susceptibility, J. MACLEOD (*Ann. Appl. Biol.*, 27 (1940), No. 3, pp. 379-392).

Cyclocephala (Ochrosidia) borealis in Connecticut, J. P. JOHNSON. (Conn. [New Haven] Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 2, pp. 79-86, figs. 2).—Among the annual species of scarabaeid beetles, the grubs of which have become more abundant and injurious to turf in the northeastern part of the United States in the last two decades, is *C. borealis* Arrow. This beetle, which occurs as far south as Alabama and westward to California, its range extending over most of the United States, was first found in Connecticut in 1931, injuring turf in Westport. Since that time it has appeared in several other towns in the southwestern part of the State, and during the past 9 yr. has injured or destroyed many acres of fine turf on lawns and golf courses. Although usually a pest of grassland, it has been reported as injurious to winter wheat in Nebraska. The adults are chestnut brown in color and are present in Connecticut for about 1 mo., beginning about June 25. They are nocturnal in habit, emerging from the soil about dusk, and are active during the early hours of the evening. "Oviposition begins the first or second day after the adults first emerge, and the eggs hatch in about 3 weeks. The larvae pass through three instars, usually entering the third instar in early September. A field population of 64 larvae per square foot was recorded in one lawn. The larvae feed upon the roots of grass, and turf injury may first appear in September. The larvae ascend and descend in the soil with the rise and fall of the soil temperatures in the spring and fall. Hibernation occurs in the larval stage during the winter at depths varying from 2 to 18 in., with the majority of the larvae at depths between 3 and 9 in. The larvae complete their growth by late May or early June. The insect spends from 4 to 5 days as a prepupa in early June. It remains in the pupal stage some 2 weeks, emerging as an adult about the third week in June. The adults have not been observed to feed, and their mouth parts are unsuited for feeding. Both male and female beetles are attracted to lights. However, light traps capture a great predominance of males and are not recommended for control. The larvae may be controlled by treating the turf with lead arsenate or carbon bisulfide emulsion diluted with water."

Melittomma insulare Fairm. (Col. Lymexyloniidae), a serious pest of coconut in the Seychelles, D. VESEY-FITZGERALD (*But. Ent. Res.*, 31 (1941), No. 4, pp. 383-402, pls. 2, figs. 2).

The nutritional requirements of *Tribolium confusum* Duval.—I, The survival of adult beetles on patent flour and complete starvation diets, B. A. SCHNEIDER (*Biol. Bul.*, 80 (1941), No. 2, pp. 208-227, figs. 7).—The experimental work reported has served to show "that (1) isolated adults of *T. confusum*,

subjected to conditions of complete starvation upon emergence, or shortly thereafter, will survive up to 26.5 days, depending upon the conditions of the experiment; (2) survivorship of starved adults is shortened and the period of larval development is lengthened by an increase in larval population density; (3) survivorship of starved adults is significantly longer and the period of larval development is significantly shorter for progeny of 6-month-old parents than for those of 1-month-old parents; [and] (4) survivorship of starved adults is shortened with increasing age."

The Ptinidae of economic importance, H. E. HINTON (*Bul. Ent. Res.*, 31 (1941), No. 4, pp. 331-381, figs. 59).—The author has found that 21 species of beetles of the family Ptinidae have been recorded as pests, most of which damage stored products. A key is given to those of economic importance. Accounts of these forms include descriptions, distribution, habits, and comparative notes. A five-page list of references to the literature is included.

Beekkeepers and the soil conservation program, R. L. PARKER. (Kans. State Col.). (*Amer. Bee Jour.*, 80 (1940), No. 12, p. 540).

Observations on nectar secretion, G. H. VANSSELL. (U. S. D. A. and Univ. Calif.). (*Amer. Bee Jour.*, 80 (1940), No. 12, pp. 556-557).

Ten new species of Stelis from California (Hymenoptera: Apoidea), P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Jour. N. Y. Ent. Soc.*, 49 (1941), No. 2, pp. 123-137).

The tipulid prey of a crabronid, G. E. ERIKSON. (Mass. State Col.). (*Bul. Brooklyn Ent. Soc.*, 35 (1940), No. 5, p. 172).—Record is made of the stocking of the nesting tunnel of *Crabro maculipennis* F. Smith with tipulid flies identified as *Nephrotoma tenuis* (Loew).

A brief note on the so-called "mysterious" disease of the spruce sawfly, J. J. DE GRAYSE (*Forestry Chron.*, 17 (1941), No. 1, pp. 43-44).—A disease of the European spruce sawfly thought to be due to a virus has been under observation at the Fredericton, N. B., forest insect laboratory of the Canadian Department of Agriculture. The disease is present in practically the entire territory infested by the sawfly, and in some regions it almost completely destroyed the 1940 larval population. This is particularly true in New Hampshire, Vermont, and to a somewhat lesser extent in Maine and New Brunswick. So far, in other areas the mortality has not been heavy enough to be of economic importance. While but little is known regarding the mode of transmission, some experiments conducted by the officials of that laboratory, in the Gaspé Peninsula, have given fairly good evidence that spraying the foliage of spruce with extracts of the body contents of the diseased insects results in the infection of healthy larvae feeding on the sprayed trees. An account of this disease in New Hampshire and Vermont by Dowden has been noted (*E. S. R.*, 84, p. 654).

The influence of temperature and season on the citrus red mite (*Paratetranychus citri*), L. L. ENGLISH and G. F. TURNIPSEED. (Ala. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 2, pp. 65-77, figs. 11).—Investigations of the influence of temperature and season on the development and abundance of the citrus red mite, commenced in 1930, are reported, the details being given in 11 graphs. The authors found several phases of the life history of this mite to be mathematically related to the average temperature computed from thermograph charts. "The length of the incubation period, the time for development from egg to adult, and the time for development from egg to egg were found to be functions of average temperature, which could be approximated by the exponential equation $y = ae^{-bx}$, where y is the period of time in days and x the average temperature in degrees Fahrenheit. The duration of adult life was found to be a linear function of average temperature, conforming to

the equation $y = -ax + b$, where y is the time in days and x is the average temperature. The average incubation period and the time for development from egg to adult formed U-shaped curves when plotted against the months from January to December. The adult life span and the total life span of mites also approximated U-shaped curves when plotted against the months of the year. The adult life span of males was found to be shorter than that of females. The population of the citrus red mite declines in hot weather and increases in cool weather. The early spring months apparently afford optimum conditions. Although the temperatures at this season do not induce the most rapid development, other factors, such as the long life of the adults and the high rate of egg production, aid in promoting the maximum population."

The avocado mite of California, a new species, E. A. MCGREGOR. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 4, pp. 85-88, figs. 12).—A species of spinning mite known to attack avocados in southern California for over a decade and which resembles the mite attacking avocados and other trees in Florida, described in 1914 as *Paratetranychus yothersi*, and officially known as the avocado red mite, is described as new under the name *P. coiti*.

Three new species of *Ornithodoros* (Acarina: Ixodoidea), R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 12, pp. 587-594, figs. 4).—A new tick of the genus *Ornithodoros* found on a white-footed mouse from San Juan County, Utah, is described under the name *O. eremicus*. Two new species taken from bats in California and Arizona, one of which was also collected in Texas and Oklahoma, are described under the names *O. stageri* and *O. yumatensis*.

Ornithodoros viguerasi, a new species of tick from bats in Cuba (Acarina: Ixodoidea), R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 9, pp. 396-399, pl. 1, fig. 1).—A new tick, larval, nymphal, and adult specimens of which were collected from bats in Cuba, is described under the name *O. viguerasi*.

Gryporhynchus tetrorchis, a new dilepidid cestode from the great blue heron, W. C. HILL. (Okla. A. and M. Col.). (*Jour. Parasitol.*, 27 (1941), No. 2, pp. 171-174, figs. 4).

ANIMAL PRODUCTION

The principles and practice of feeding farm animals, E. T. HALNAN and F. H. GARNER (London and New York: Longmans, Green & Co., [1940], pp. X+359, [pls.] 8, figs. 8).—A presentation of the principles of nutrition and their application to the feeding of livestock. A chapter on feeding in wartime, especially in the British Isles, is included.

The American Society of Animal Production: Record of proceedings of the thirty-third annual meeting, November 29-December 1, 1940 (*Amer. Soc. Anim. Prod. Proc.*, 33 (1940), pp. 400, figs. 17).—The following papers on horse, beef cattle, sheep, and swine production and meats were presented at the 1940 meeting (*E. S. R.*, 83, p. 380). Other papers are noted on pages 327 and 391.

The Horse and Mule Program on Farm Security Farms, by A. B. Caine, D. Hammerly, and J. N. Spencer (pp. 83-87) (Iowa State Col.); Draft Horse Type and the Breeder, by J. L. Edmonds (pp. 87-89) (Univ. Ill.); Effects of Pasture Fertilization on Growth of Mule Colts, by F. R. Edwards (pp. 90-96) (Ga. Expt. Sta.); Problems in the Production of Thoroughbred Horses, by L. J. Horlacher (pp. 96-98) (Univ. Ky.); Recent Reproduction Studies on Equines, by F. F. McKenzie (pp. 98-102) (Mo. Sta. coop. U. S. D. A.); Five Years' Results in Individual Limited and Full-Feeding of Growing and Fattening Calves, by G. A. Branaman, G. A. Brown, and G. J. Propp (pp. 105-108) (Mich. Sta.); High-Phosphorus vs.

Low-Phosphorus Red Clover Hay for Growing Calves, by H. R. Duncan (pp. 109-111) (Univ. Tenn.); The Effect of Partial Thyroidectomy on the Fattening of Steers—A Preliminary Report, by F. N. Andrews and J. F. Bullard (pp. 112-116) (Ind. Sta.); Fattening Steers Individually and in Groups on Milo Grain at Two Levels of Feeding, by W. H. Black, P. E. Howe, and J. M. Jones (pp. 117-121) (U. S. D. A. and Tex. Sta.); Some Factors in the Management of Beef Cattle Pastures in Louisiana, by C. I. Bray (pp. 122-125) (La. Sta.); Corn Silage Studies, by E. A. Livesay, A. H. VanLandingham, and B. H. Schneider (pp. 126-130) (W. Va. Sta.); A Preliminary Report on the Shrinkage Occurring in Sealed and Unsealed Silos, by R. R. Snapp and H. W. Bean (pp. 130-131) (Univ. Ill.); Vitamin Deficiencies in a Ration for Brood Sows, by A. G. Hogan and V. F. McRoberts (pp. 139-143) (Univ. Mo.); Carotene Supplements to a Barley Ration for Growing and Fattening Pigs in Dry Lot, by C. P. Thompson and J. C. Hillier (pp. 143-145) (Okla. A. and M. Col.); The Riboflavin Content of California Barley Is Sufficient for the Growing Pig, by E. H. Hughes and N. B. Ittner (pp. 146-148) (Univ. Calif.); Effects of High Protein on Pigs, by W. L. Robison (pp. 149-152) (Ohio Sta.); The Discriminant Function Applied to Quality Rating in Sheep, by G. W. Brier, R. G. Schott, and V. L. Simmons (pp. 153-160), and The Application of a Rapid Comparator Method for Determining Fineness and Variability in Wool, by E. M. Pohle (pp. 161-168) (both U. S. D. A.); A Comparison of Rambouillet and Corriedale Sheep Under Southwest Texas Range Conditions, by J. M. Jones, W. H. Dameron, B. L. Warwick, and S. P. Davis (pp. 169-172) (Tex. Sta. coop. U. S. D. A.); Growth in Corriedale and Rambouillet Sheep Under Range Conditions, by R. W. Phillips, J. A. Stoehr, and G. W. Brier (pp. 173-181) (U. S. D. A.); Breeding for Single and Twin Lamb Production, by O. M. Kiser and R. J. Christgau (pp. 182-184) (Minn. Sta.); The Relation of Feeding and Management to the Cause of the Stiff-Lamb Disease, by J. P. Willman, C. M. McCay, F. B. Morrison, and L. A. Maynard (pp. 185-192) ([N. Y.] Cornell Sta. et al.); Factors Influencing the Value of Range Fleeces—Studies in Fleece Length, Fineness, Density, Yield, and Value, by R. H. Burns and A. Johnston (pp. 192-198) (Wyo. Sta.); Progress Report on What Causes Beef to Cut Dark in Color, by D. H. LaVoi (pp. 266-270); Beef Liver Condemnations, by H. R. Smith (pp. 272-276); The Effect of Paradichlorobenzene Upon the Flavor of Pork, by W. J. Loeffel (pp. 277-278) (Nebr. Sta.); Swine Type as a Factor in Pork Production, by J. H. Zeller (pp. 279-283), and A Study of Carcass Characteristics in Relation to Type of Hog, by O. G. Hankins (pp. 284-289) (both U. S. D. A.); Freezer Storage Temperature as Related to Drip and to Color in Frozen-Defrosted Beef, by J. M. Ramsbottom and C. H. Koonz (p. 290); The Minimum Calcium and Phosphorus Requirements of Growing Pigs, by C. E. Aubel, J. S. Hughes, and W. J. Peterson (pp. 311-315) (Kans. Sta.); Studies Upon the Relation of Nutrition to the Development of Necrotic Enteritis in Swine—II, Nicotinic Acid, Yeast, and Liver in the Prevention of Necrotic Enteritis in Young Pigs Fed Massive Doses of *S[almonella] choleraesuis*, by G. K. Davis and V. A. Freeman (pp. 316-323) (Mich. Sta.) (El. S. R., 83, p. 97); Metabolism and Dispensability of Nicotinic Acid in Sheep, by P. B. Pearson (pp. 323-325) (Tex. A. and M. Col.); Growth on Manganese-Low Rations, by S. R. Johnson (pp. 325-331) (Ark. Sta.); The Measurement of Partial Nutritive Equivalents, by M. Kleiber (pp. 332-339) (Univ. Calif.); Further Studies of the Influence of Fat Intake on Milk and Fat Secretion, by L. A. Maynard, J. K. Loosli, and C. M. McCay (pp. 340-344) (Cornell Univ.) (El. S. R., 82, p. 95); Relation of Recent Changes in Processing to the Value of Feeding Stuffs, by H. R. Kraybill (pp. 344-352) (Purdue Univ.); and Reports on Feeding Trials and Nutritional Work, by H. M. Briggs (pp. 352-362) (Okla. A. and M. Col.).

[*Animal husbandry studies in Mississippi*] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 12, p. 8; 4 (1941), Nos. 1, pp. 4, 6; 2, pp. 1, 5, 7).—The following articles are included in these numbers:

Vol. 3, No. 12.—Grazing Crops for Laying Hens, by H. D. Polk (p. 8), and Work Mules Show Better Response to Lespedeza Hay, by R. H. Means (p. 8).

Vol. 4, No. 1.—Storage of Cured Pork, Cottonseed Meal for Pigs, Calves From Native Cows and Beef Type Bulls, Feeding Work Stock on Mississippi Farms, and Corriedale-Native Grade Sheep Show Promise, all by C. Dorman (p. 4), and Grazing Crops for Laying Hens, by H. D. Polk (p. 6).

Vol. 4, No. 2.—Feeding Tests for Surplus Small Grains, by H. H. Leveck (pp. 1, 7); Economical Rations for Work Mules, Pork Production, and Building Delta Pastures, all by C. Dorman (p. 5).

A critique of length-weight ratios, I. M. LERNER. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 234-242).—After consideration of length: weight ratios as indexes of conformation, the author concluded that a table of desirable shank lengths for given body weights, as prepared by R. G. Jaap,⁵ is adequate for selection of improved meat type among birds of the same age.

This is preferred over ratios using the cube root of body weight or the third power of linear measurements where growth is not isometric. Empirical values of the exponents in allometric equations (E. S. R., 82, p. 321) are suggested.

Effect of changes in milling and manufacturing of feeds on their nutritional value, C. W. SIEVERT (*Poultry Sci.*, 20 (1941), No. 3, pp. 206-209).—Attention is called to the need for exercising special care in the description of characteristics of feeds in poultry rations, including particularly meat products, fish meal, milk products, wheat mill feeds, corn products, oil meals, and alfalfa products.

Chemical estimation of quality in animal protein concentrates, H. J. ALMQUIST. (Univ. Calif.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 347-350, fig. 1).—The protein quality index and chemical analyses of proteins according to the methods previously noted (E. S. R., 74, p. 529) were employed in a comparison of several animal proteins and mixtures. The chemical tests aid in discovering reasons for underlying differences found in the biological tests by such factors as differences in the amounts of digestible proteins.

The specific dynamic effects of amino acids and their bearing on the causes of specific dynamic effects of proteins, M. KRISS. (Pa. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 3, pp. 257-274).—Support was given to the theory that the dynamic effects of amino acids and therefore of proteins are byproducts of intermediary chemical reactions and energy changes, rather than acting in the body as special metabolic stimulants in the pharmacodynamic sense. Employing methods similar to those followed in previous investigations (E. S. R., 81, p. 256), determinations were made of the specific dynamic effects of amino acids added as supplements to a basal ration for rats which proved adequate for maintenance of equilibrium of N and energy. After a basal period of approximately 3 weeks concluded with a respiration trial, the diet was supplemented for groups of from five to six rats with each of the amino acids supplying approximately 7,500 calories of gross energy per day for 8 days. The increased heat production was determined for empty body weight and by comparison with preceding and following periods on the basal ration. There was much variability in the expression of specific dynamic effects of the amino acids as calories per gram of amino acid consumed or as calories per gram

⁵ U. S. Egg and Poultry Mag., 44 (1938), No. 8, pp. 488-489, 503.

of amino acid metabolized. By both of these methods glutamic acid, alanine, and tyrosine rated higher than glycine, aspartic acid, and asparagine. Analysis of different methods of expressing these effects showed that the dynamic effects of these nutrients, determined by the heat production of maintenance, were best correlated with the metabolizable energy of that amino acid. The metabolism of carbon in the amino acid seemed to be a more important factor in the production of specific dynamic effects than the metabolism of N.

The nutritive value of Alaska pea protein plus *dl*-valine. J. W. Cook and E. I. ROBERTSON. (Wash. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 201-203).—The addition of 3 percent of protein from pea meal to a ration for baby chicks containing 8 percent of protein, mainly from corn, wheat, and oats, stimulated gains per gram of protein eaten during a 2-week period from 2.05 gm. on the basal ration to 2.44 gm. The addition of *dl*-valine with the pea meal did not produce greater growth, but when 3 percent of protein from casein was added to the basal ration gains were increased about twice as much as from pea meal alone, 2.87 gm. Thus *dl*-valine was evidently not the limiting factor in pea meal nutrition.

Vitamin A studies with foxes. A. I. COOMBES, G. L. OTT, and W. WISNICKY. (Wis. Expt. Sta.). (*North Amer. Vet.*, 21 (1940), No. 10, pp. 601-606, fig. 1).—Silver foxes exhibited satisfactory growth to maturity on an experimental ration supplying from 0.1 to 0.2 μ g. of vitamin A per gram of wet feed. However, the vitamin A levels in the blood and liver were extremely low as compared with foxes receiving carotene or cod-liver oil. These results were obtained with groups of 32- to 35-day-old foxes kept on these rations for 210 days, and are interpreted to indicate that foxes are poor in utilizing carotene as a source of vitamin A since there was no carotene in the liver and little in the blood of animals receiving rations low in vitamin A but supplemented for a brief period.

A quantitative study of vitamins in the rumen content of sheep and cows fed vitamin-low diets. III, IV, L. W. McELROY and H. GOSS. (Univ. Calif.). (*Jour. Nutr.*, 21 (1941), Nos. 2, pp. 163-173, fig. 1; 4, pp. 405-409).—Two papers are presented in continuation of this series (*E. S. R.*, 85, p. 94).

III. Thiamin.—The dried rumen and reticulum contents of four sheep fed a thiamin-deficient ration were found to furnish approximately 7 μ g. of thiamin per gram, as determined in assays on chicks. Thus, sheep were able to synthesize the vitamin. On the other hand, the dried rumen contents of two cows with artificial fistulas in the rumen contained no thiamin, although the milk from one cow was estimated to contain from 2 to 2.5 μ g. per gram. Thiamin was detected in the rumen contents of a nonfistulated cow on the deficient ration. This finding led to the suggestion of a possible interference of the fistula with the activity of the thiamin-producing organisms in the rumen or that thiamin was formed posterior to the fistula, since thiamin does not appear to be essential in the feed of ruminants.

IV. Pantothenic acid.—Employing the animals kept on the vitamin B complex-low ration of the above experiment, the authors found that the rumen and reticulum contents from the sheep as supplements to a heat-treated diet of natural feeds for chicks supplied 5 chick units (70 μ g.) of pantothenic acid per gram. The rumen contents from two cows furnished 61 and 94 μ g., respectively, of the vitamin per gram, even though there were only 2.8 μ g. of pantothenic acid in the ration consumed. There were 46 μ g. of the vitamin per gram in the dried skim milk.

Determining riboflavin in dried milk products.—II, Seasonal variations, R. A. SULLIVAN and E. BLOOM (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 346-349, fig. 1).—A total of 244 samples of dried whey collected from six different drying

plants at various times over a 2-yr. period were analyzed by the method noted on page 298. The average concentration of all samples was 25.1 μ g. of riboflavin per gram. While winter samples consistently contained less riboflavin than those produced in other seasons of the year, the maximum deviation amounted to only 7 percent of the total concentration, which is considered insignificant for practical feeding purposes.

Animal nutrition: Vitamin E, B. W. FAIRBANKS and E. CURZON. (Univ. Ill.). (*North Amer. Vet.*, 22 (1941), No. 3, pp. 143-146).—An account of the role of vitamin E in growth and reproduction of poultry, cattle, swine, sheep, and experimental animals is presented.

Vitamin-free diets for animal experiments, A. L. BACHARACH (*Nature* [London], 146 (1940), No. 3688, pp. 28-29).—Replacement of rice starch by wheat starch in rations deficient in vitamins A, B₁, and E proved satisfactory, but limitation of growth on the filtrate factor-deficient ration did not occur and replacement under these conditions was therefore not satisfactory.

Skin temperatures of the pig, goat, and sheep under winter conditions, R. C. LEE, N. F. COLOVOS, and E. G. RITZMAN. (N. H. Expt. Sta. et al.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 321-326, fig. 1).—Supplementing reports of metabolism and skin temperatures of cattle by Benedict and Ritzman (E. S. R., 57, p. 863), results of comparable studies of other animals showed that changes in the skin temperature at the base of hairs on the side of the animal cannot be used as an indication of metabolic changes. The external protective coat and the fat insulation in and beneath the skin and variations in the external temperatures may account for wide variations in the skin temperatures. Even with environmental temperatures varying from -12° to +21° C., the ewe, ram, and goat maintained skin temperatures near 30°, with the pig temperature somewhat lower at low environmental temperatures. This was accounted for by the quality of their respective protective coats. Comparison is given of the skin temperature and metabolism measurements under a wide range of environmental temperatures.

Effect of temperature and humidity on colour of lean and development of rancidity in the fat of pork during frozen storage, W. H. COOK and W. H. WHITE (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. D, pp. 53-60).—Using methods previously employed in the storage of poultry (E. S. R., 82, p. 800), the authors showed, in analyses of variance of the quantitative color measurements of pork, that difference in temperature was a primary factor affecting the color of lean and rancidity of fat. There were various degrees of surface drying in the prime pork back cuts stored for 48 weeks at temperatures from -6.6° to -23° C. Below -18° the color was unchanged. Free fatty acids increased significantly between -12.2° and -6.6°. The difference in variance due to differences in humidity was not significant.

Feeding wheat to beef cattle, D. E. RICHARDS. (Oreg. Expt. Sta.). (*East. Oreg. Wheat League Proc.*, 18 (1940), pp. 22-25, fig. 1).—In a 129-day feeding test, coarsely ground wheat with alfalfa and grass hay was found to make a very practical ration for Hereford steers, the gains being 2.84 lb. per head daily. When the feed was made up of one-half wheat and one-half rye the rate of gain was 2.48 lb. There was a high dressing percentage, and the cattle were attractive to buyers. When molasses was fed in the ration the cattle consumed the same amount of grain, but the gain was only 2.31 lb. per head daily.

The use of Sudan grass pastures and other feeds for beef production, J. H. and J. M. JONES, R. A. HALL, and E. M. NEAL (*Texas Sta. Bul.* 599 (1941),

pp. 29, figs. 11).—Sudan grass pasture was successfully utilized for summer grazing and winter feeding and finishing of steer calves with and without supplements at the Beeville Substation. In general, the financial returns did not favor supplemental feeding, but greater total gains and better market finish were produced with supplemental feeding and finishing in dry lot following the grazing period. Creditable finish of heavy yearling steers was induced in 140 days with cottonseed cake or ground ear corn in addition to Sudan pasture. Thin yearling steers required 100 days of dry lot finishing after 70 days of feeding on cottonseed cake or ground ear corn in addition to Sudan pasture.

Sheep, farm and station management, E. H. PEARSE (*Sydney and London: Pastoral Rer. Pty. Ltd.*, [1940], 4 ed., rev. and enl., pp. XVI+629, figs. [158]).—This is a new edition of the book previously noted (E. S. R., 70, p. 818) on the problems of production, breeding, and management of fine-wool sheep, with special attention to pasture conservation and improvement. Chapters on sheep diseases and parasites are included.

Experiments on the wintering of mountain ewes, M. GRIFFITH and L. PHILLIPS (*Welsh Jour. Agr.*, 16 (1940), pp. 206-226).—In two 1-yr. wintering experiments with mountain ewes it was found that the heaviest lambs at birth made the most rapid gains up to weaning. The most rapid gains during summer were made by lambs wintered on improved hill pastures. The largest numbers and greatest live weight of lambs were reared by ewes on winter foggage. There were compared in the wintering two feeds per day of dried grass and corn and limited grazing on marrow stem kale, timothy in rows, and foggage, in addition to improved hill pasture. In these lots there were employed approximately 75 head of ewes in 1937-38 and 45 in 1938-39.

Skeleton of structure in new-born Astrakhan lambs in relation to supply of food to their mothers, E. G. ANDREEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 7, pp. 746-749).—Bone measurements are given of single and twin lambs produced by ewes fed on three rations with different amounts of nutrients.

Muscular system of embryonic lambs as affected by food rationing to their mothers, R. M. SHAKHUNIANZ (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 7, pp. 750-752).—Study is reported of the relation of muscle weight to skeleton size and weight of the astrakhan (Karakul) lambs from mothers fed high, low, and medium rations during the last 20 days of gestation in the above study. On account of the increased amounts of muscle laid down, the ratio of muscle:skeleton increased from the lower to the higher rations. Limitation of the nutrition of the singles as compared with twins tended to reduce the proportion of muscle tissue produced and the ratio of muscle:skeletal tissue.

Fattening early and late lambs, A. J. DYER and L. A. WEAVER (*Missouri Sta. Bul.* 425 (1941), pp. 16, figs. 2).—In two tests, purebred early lambs creep fed shelled corn in addition to their mother's milk and pasture in 1934 and 1935 made approximately 0.06 lb. per day more rapid gains than comparable groups not receiving the grain. Two tests with late lambs conducted in the same years showed that grain and hay feeding in dry lot produced more rapid gains than feeding on pasture. Feeding pastured lambs in dry lot for a short period before slaughter produced as high a degree of finish as dry lot feeding. Late lambs grazed on pasture alone made good gains and developed reasonably good market finish.

The optimum level of protein intake for the growth and fattening of swine, R. C. MILLER and T. B. KEITH. (Pa. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 419-429).—Four experiments comparing the rate of gain and feed

required per unit of gain by pigs of different weights on rations containing from 10 to 27 percent of protein are reported. From these results it was concluded that from 15 to 17 percent of protein was the optimum for pigs from 40 to 210 lb. in weight. Higher levels were favored for pigs from weaning to 75 lb. The lower levels of protein were preferred for pigs from 120 to 200 lb., but rations containing from 10 to 12 percent of protein were unsatisfactory.

The effect of a submaintenance diet on the composition of the pig, R. W. POMEROY (*Jour. Agr. Sci. [England]*, 31 (1941), No. 1, pp. 50-73, pl. 1, figs. 5).—The tissues of the carcass of pigs on a submaintenance diet were affected in inverse ratio to their development, i. e., fat most, muscle less, and bone least. These conclusions were derived from study of the carcasses of inbred barrows fed to 327 lb. live weight. Others were subsequently slaughtered after weights of 302, 263, 224, and 188 lb., respectively, were attained after being on a ration of straw and water. The early-maturing organs, i. e., brain, eyes, etc., continued to grow, but the other organs suffered a greater or lesser degree of atrophy, probably determined by suspension of function. Within the fat storage the kidney fat was reduced first, then the subcutaneous fat, and last the early-developing intermuscular, caul, and mesenteric fat. The changes in composition of the body parts on the submaintenance rations are presented.

Growth and development in the pig, with special reference to carcass quality characters, IV, V, C. P. McMEEKAN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 1, pp. 1-49).—Two papers are presented in continuation of the series previously noted (E. S. R., 84, p. 377).

IV. *The use of sample joints and of carcass measurements as indices of the composition of the bacon pig* (pp. 1-17).—Measurements of the amounts of bone, muscle, and fat were accurately predicted for the 200-lb. pork carcasses produced in connection with the nutrition experiments. Correlation between the composition and the measurements of the loin and leg showed the highest predictive values for the 11 barrows and 9 gilts. The correlations obtained between the bone, muscle, and fat in these parts and in the whole carcass were 0.9444, 0.9765, and 0.9750, respectively. External carcass measurements were indicative of skeletal development but were influenced by flesh cover. Linear measurements of the muscle at the cross section at the junction of the thorax and loin were highly correlated with the weight of the entire muscle, the correlation being 0.9839. Correlations of fat determinations in the carcass as a whole and thickness of back fat were particularly strong. "It is contended that the relationships established will, because of their biological basis, apply in principle, though not necessarily with the same mathematical constants, to all pigs of the same body weight, whatever their origin, breed, or type."

V. *The bearing of the main principles emerging upon the many problems of animal production and human development* (pp. 17-24).—This study showed that the animal body can be molded and shaped to a remarkable degree by changes in the environment, but, at the same time, there is possessed a remarkable recuperative ability. Severe undernourishment produced characteristics comparable with the primitive and unimproved types. However, whether the physiology of the animal and conditions to which it is exposed can affect the germ plasm is left a matter for speculation.

The essential nature of pantothenic acid and another alkali labile factor in the nutrition of the dog, J. M. MCKIBBIN, S. BLACK, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 130 (1940), No. 2, pp. 365-372, figs. 2).—In accordance with previous findings (E. S. R., 83, p. 236), evidence is presented on the necessity in newly weaned and older growing dogs for pantothenic acid in addition to factor W. The need for supplementing a diet

which contained alkali-inactivated or acid-ether-extracted liver with pantothenic acid was made evident by the growth response of four young dogs and six growing animals. There is an alkali-labile factor other than pantothenic acid necessary for the dog.

Inhibition by sulfapyridine of the curative action of nicotinic acid in dogs, R. WEST (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 369-371, fig. 1).—Seven dogs on a nicotinic acid-deficient ration were found to respond promptly by gains in weight to nicotinic acid supplements, but when sulfapyridine was given nicotinic acid failed to correct the deficiency.

The normal growth of chickens, H. L. KEMPSTER (*Missouri Sta. Bul.* 428 (1941), pp. 20, figs. 10).—The average weights are given at 4-week intervals to 40 weeks of age for Rhode Island Red, White Plymouth Rock, White Leghorn, New Hampshire, and White Wyandotte pullets hatched and reared on the station farm during the last decade. As in the former study (*E. S. R.*, 76, p. 676), all breeds made the greatest gains from 9 to 12 weeks of age, and early-hatched chicks grew more rapidly than late-hatched chicks during the first part of the growing period. The rate of growth of the late-hatched chicks was compensated by more rapid growth during the latter portion of the growing period. At 40 weeks of age the chicks showed no difference in body weight. Variations in growth were associated with climatic conditions, especially temperature. Birds eventually diagnosed as having paralysis grew at a normal rate until disease symptoms became pronounced.

Heart rate of the domestic fowl, E. H. McNALLY. (*U. S. D. A.*). (*Poultry Sci.*, 20 (1941), No. 3, pp. 266-271, figs. 2).—Heart rate in fowls showed much variability. The average of six Rhode Island Red and six Single-Comb White Leghorns of each sex was 282 beats per minute during the day, ranging from 192 in a Rhode Island Red ♂ to 396 in a White Leghorn ♀. The heart rate was lowered during inactivity to as low as 160 in a Rhode Island Red ♂ at from 1 to 3 a. m. The negative correlation between heart rate and body weight seemed more fundamental than breed or sex relations. The heart weight: body weight ratio of Rhode Island Reds was lower than that reported for other fowls by Winchester (*E. S. R.*, 83, p. 672).

Farm poultry production, L. E. CARD and M. HENDERSON (*Danville, Ill.: Interstate*, 1940, 3. ed., pp. [245], figs. [61]).—The principles of poultry husbandry are cited, including judging, feeding, housing, incubation, marketing, breeding, and disease and parasite control. The first edition of this book has been previously noted (*E. S. R.*, 72, p. 275).

The scientific feeding of chickens, H. W. TITUS (*Danville, Ill.: Interstate*, 1941, pp. 116, figs. 2).—The principles of poultry feeding; the requirements of birds for different purposes in various age groups; the effects of various deficiencies, including vitamins; and the composition and nutrients furnished by various poultry feeds are presented.

Productive energy of corn meal, alfalfa leaf meal, dried buttermilk, casein, cottonseed meal, and tankage as measured by production of fat and flesh by growing chickens, G. S. FRAPS and E. C. CARLYLE (*Texas Sta. Bul.* 600 (1941), pp. 41).—The productive energy for growing and fattening chickens of several feeds was calculated by methods previously described (*E. S. R.*, 82, p. 377) with revisions in the metabolizable value of protein to 4.4 Calories per gram (*E. S. R.*, 84, p. 231). The average productive energy calculated from analysis of the chicks and feed samples in 11 experiments was 278 calories per 100 gm. of effective digestible nutrients in the standard mixed ration of yellow corn meal, wheat gray shorts, dried buttermilk, cottonseed meal, alfalfa leaf meal, tankage, bone meal, and minerals. After replacement of approximately

one-half of the yellow corn meal for 3 weeks and analysis of the chicks, the productive energy per 100 gm. of effective digestible nutrients was calculated as 300 calories for corn meal, 241 for alfalfa, 243 for dried buttermilk, 298 for casein, 280 for cottonseed meal, 240 for tankage, and 279 calories for wheat gray shorts. A high protein content of the ration did not interfere with the energy utilization. The productive energy of delinted cottonseed and oat hulls was practically nil. Cottonseed oil showed less productive energy than was expected. Corn bran, corn gluten meal, and cottonseed flour were equal to corn meal.

Effect of soybean oil meal on avian reproduction, H. S. WILGUS, JR., and F. X. GASSNER. (Colo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 290-293).—A ration of ground yellow corn, dried brewers' yeast residuals, soybean meal, steamed bonemeal, salt, and vitamin D oil, which supported fairly good growth, allowed the production of severe goiter when feeds low in iodine were used. Both egg production and hatchability on this ration were low, but hatchability was improved by the replacement of part of the soybean meal by casein and oat groats and by wheat bran and meat scraps. Hatchability was still further improved when a mixture of cereal products (corn, wheat, and oats) was added to the ration containing 6 percent of soybean meal, but the hatchability did not equal that on a practical ration. Unless 5 percent of meat scrap was fed, few of the chicks survived. The poor hatchability could not have been caused by a deficiency of riboflavin or Mn since the ration was supplemented with yeast and Mn. It is suggested that the poor reproduction was related to the goitrogenicity of soybean meal, which might stimulate the hypophysis and depress reproduction by excess amounts of thyrotropic or gonadotropic hormones.

Hatching weight of chicks from hens fed different protein levels, R. PENQUITE and T. T. MILBY. (Okla. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 195-200, fig. 1).—Studies of the relation of protein content of the ration to the weight of newly hatched chicks showed that the chicks from hens fed high levels of protein were smaller than would be expected on the basis of egg size and vice versa. These results were obtained in each of three trials in which 95, 424, and 932 chicks were produced. However, the differences obtained in the second trial were not significant. The protein levels fed to groups in the different years varied from 12 to 25 percent. In the analysis of variance and covariance of egg weights and chick weights, correlations showed that 12 percent of the variation in chick weight at hatching was due to factors other than variation in egg weight. Association in the egg and chick weights produced by 143 hens gave a correlation of 0.94.

Amino acids for chicks, H. J. ALMQUIST. (Univ. Calif.). (*Flour & Feed*, 41 (1941), No. 10, pp. 8-9, figs. 4).—The amino acids needed by chicks for optimum growth are given as arginine, histidine, tryptophan, methionine, glycine, and lysine. Attention is called to the effectiveness of choline in preventing perosis, cited by Jukes (*E. S. R.*, 85, p. 97), and the decreased growth rate produced with digested casein as compared with whole casein.

The minerals in poultry nutrition.—A review, P. J. SCHAEFER. (Mich. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 278-288).—The review of literature shows the need and function of various minerals in poultry nutrition and variations which may be encountered in poultry feeds. It is suggested that if the feeds are judiciously blended "to provide a sufficiency of other nutrients, they supply an adequate amount of most minerals. . . . Vegetable protein concentrates require the addition of extra mineral to be comparable to the animal products they displace." It is thus ordinarily necessary to add inexpensive sources of Ca, Mn, and grit to the poultry ration.

Requirement of potassium by the chick, B. BEN-DOR. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 2, pp. 341-343).—Chicks were found to require a supplement of at least 0.172 percent of K in the diet to induce maximum growth, and over 0.13 percent was needed to prevent heavy mortality. Rubidium added to a ration containing 0.072 percent of K slightly stimulated growth. These tests were carried out with eight groups of chicks on rations devoid of K to which from 0.076 to 0.4 percent of K was added.

The effect of selenized grains on the rate of growth in chicks, W. E. POLEY, W. O. WILSON, A. L. MOXON, and J. B. TAYLOR. (S. Dak. Expt. Sta.). (*Poultry Sci.*, 20 (1940), No. 2, pp. 171-179, fig. 1).—Continuing previous findings on the effect of Se on chick growth (E. S. R., 82, p. 659), the authors found that from 5 to 8 p. p. m. of Se in the growing ration of pullets from 8 to 24 weeks of age produced growth equal to that of pullets receiving no Se. Both ♂s and ♀s on rations with 2 p. p. m. of Se grew somewhat faster than those receiving no Se in five of six trials. Possibly, the stimulating effects of small quantities of Se in starting rations may have tended to offset any deleterious effects during the embryonic period from hens receiving Se in the diet. Two series of trials were conducted in which rations free of Se and containing 2, 5, 8, 10, and 14 p. p. m. were included in the ration. Rations with over 8 p. p. m. were definitely injurious.

Isolation of an organism responsible for the increased riboflavin content of the feces of the fowl, A. E. SCHUMACHER and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 272-277).—Since Lamoreux and Schumacher found that riboflavin increased in the feces of fowls when voided (E. S. R., 84, p. 514), study was made of the riboflavin production of feces by purified cultures isolated from the feces when grown on sterile fecal material. One culture was found to produce 13.37% after 7 days' growth, as contrasted with 6.47% by the control. On further purification and with different types of media, the riboflavin content could be increased from 100 to 300 times in a period of from 6 to 7 days, whereas the riboflavin content of a water extract of the feces was not increased. The active organism was aerobic, with an optimum temperature range of from 20° to 22° C. The morphological and physiological characteristics of the active organism are described.

The vitamin D requirement of turkey poults, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 204-205).—Evidently, 80 A. O. A. C. chick units of vitamin D per 100 gm. of feed satisfied the requirement of growing poults. This amount does not justify the larger requirement of 200 chick units indicated by Jukes and Sanford (E. S. R., 81, p. 698). Poults were given vitamin D in amounts from 20 to 200 chick units from cod-liver oil and from 50 to 500 units from activated animal provitamin D. Neither live weight nor bone ash was increased with amounts above 80 units per 100 gm. of feed.

The cage system for managing laying hens, L. N. BERRY (*New Mexico Sta. Bul.* 276 (1941), pp. 14, figs. 3).—Rhode Island Red and White Leghorn hens kept in cages in four 1-yr. studies produced an average of approximately 34 eggs more per bird than comparable birds in open pens. The mortality was reduced, and there were certain advantages for the methods of management. However, the costs and feed consumption were slightly greater. The cage system is recommended especially for poultry raisers located near good markets and those following intensified production.

Viability and weight of chicks as affected by shipping and time without feed, M. W. OLSEN and B. WINTON. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 243-250, figs. 6).—Study of the weight changes and mortality at 3 days and 2 weeks of age of chicks which had been held or shipped different dis-

tances showed that feed and water may be withheld for 60 hr. after hatching without materially affecting growth, provided the environmental conditions available were favorable. Viability was materially reduced in chicks shipped more than 90 hr. without feed. When chicks approximately 12 hr. old were shipped roughly 735, 1,551, 2,400, and 3,050 miles, requiring about 1, 2, 3, and 4 days, respectively, these chicks lost approximately 1 lb. of weight per 100 chicks during the first 24-hr. nonfeed period and 0.75 lb. per 100 chicks in each subsequent 24 hr. of the trip. Chicks that lost least weight during transit weighed the most and had the highest viability at 2 weeks of age. Seasonal influences were included by making shipments in the fall, winter, and spring to each location, but reasons for the differences were not apparent. It is mentioned that distances, temperatures, and numbers of transfers may have been responsible.

DAIRY FARMING—DAIRYING

[Papers on dairy cattle in the 1940 proceedings of the American Society of Animal Production] (*Amer. Soc. Anim. Prod. Proc.*, 33 (1940), pp. 7-83).—In addition to papers noted on pages 327 and 381, the following papers were presented before the dairy cattle section: The Nutritive Value of Roughages, With Special Reference to Rations of Pasture Alone and Alfalfa Alone, by T. E. Woodward (pp. 47-55) (U. S. D. A.); The Preparation and Nutritive Value of Grass Silage, by G. Bohstedt (pp. 57-63) (Univ. Wis.); Effect of Stilbestrol on the Mammary Gland, by A. A. Lewis and C. W. Turner (pp. 63-66) (Mo. Expt. Sta.); Carotene (Provitamin A) Requirements of Dairy Cattle for Reproduction, by A. H. Kuhlman and W. D. Gallup (pp. 67-73) (Okla. A. and M. Col.); Butterfat Production, Reproduction, Growth, and Longevity in Relation to Age at First Calving, by G. E. Dickerson and A. B. Chapman (pp. 76-81) (Wis. Sta.); and Cod-Liver Oil as a Supplement for Dairy Calves When Fed Alfalfa Hay, by H. T. Converse and M. H. Fohrman (pp. 82-83) (U. S. D. A.).

Feeding and management of the dairy herd, A. L. DARNELL (*Tex. Agr. Col. Bul.*, 4 ser., 11 (1940), No. 15, pp. 54).—A concise handbook on dairy cattle feeding and management, with particular reference to general conditions in Texas.

The milk-producing qualities of certain proteins: The special role played by amino-acid cystine, D. B. SMUTS and B. A. DE TOIT (*Farming in So. Africa*, 16 (1941), No. 179, pp. 49-50).—Female litter-mate rats fed the same balanced ration during their period of pregnancy were placed on a diet containing alfalfa as the sole source of protein 7 days before littering. Two days after littering the young were reduced to five per mother, and groups of lactating females were fed rations containing 9.6 percent protein from the following sources: (1) Alfalfa, (2) alfalfa plus 0.2 percent cystine, (3) alfalfa plus 0.4 percent cystine, (4) one-half alfalfa and one-half corn, and (5) peanut meal. The average loss of weight by the mothers during 27 days of lactation was 57.5, 42.3, 40.5, 48.5, and 40 gm., and the average gain in weight per litter over that period was 36, 55.7, 61.8, 53.7, and 46.2 gm. for groups 1 to 5, respectively. The value of cystine as a supplement to alfalfa protein for milk production is thus clearly demonstrated, while it appears that the ration containing 50 percent of the protein from corn is deficient in this essential amino acid.

The effect of rations deficient in phosphorus and protein on ovulation, estrous, and reproduction of dairy heifers, L. S. PALMER, T. W. GULLICKSON, W. L. BOYD, C. P. FITCH, and J. W. NELSON. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 199-210, figs. 5).—Following earlier investigations (E. S. R., 75, p. 684), experiments were conducted over a period of 6 yr. on the effect of combined phosphorus and protein deficiency in dairy heifers and

calves with rations consisting largely of prairie hay from phosphorus-deficient areas. A small amount of grain mixture and plain or molasses beet pulp comprised the only supplement. Such a feeding regime commonly resulted in delayed sexual maturity and repression of normal evidence of oestrus but did not interfere with the normal regularity of ovulation or the ease of conception. Marked dystocia occurred in 50 percent of the animals used in the breeding studies, which is attributed in large measure to the dietary deficiency imposed.

Causes of variation in milk and butterfat yield of dairy cows, I. JOHANSSON and A. HANSSON (*K. Lantbr. Akad. Tidskr.*, 79 (1940), No. 6½, pp. 127, figs. 30; *Swed. abs.*, pp. 121-123).—This extensive report is based on detailed statistical analyses of about 3,000 lactation records obtained from 13 herds of Swedish Red and White cattle over a period of 15 yr. A standard 300-day lactation period was used in all computations. The influence of various factors on total milk and butterfat yield, butterfat percentage, persistency of yield, and length of the calving interval is discussed. Estimates of the hereditary part of the total variance in regard to the characters under investigation were as follows: Butterfat percentage 70-80, total yield (milk or butterfat) 30-40, persistency of yield 15-30, and length of the calving interval 0-5 percent.

Factors involved in the ejection of milk, F. ELY and W. E. PETERSEN. (Ky. and Minn. Expt. Stas.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 211-223, figs. 16).—In this series of experiments with Jersey cows denervating one-half of the mammary gland during the dry period had no apparent effect on the rate of ejection of milk or in the appearance of the gland during the subsequent lactation. Subjecting the animals to fright or intrajugular injections of adrenalin resulted in cessation of the ejection of milk. From 16 to 20 min. elapsed before a small amount of the milk was ejected following the injection of 3 cc. of 1:1,000 adrenalin solution, while the response was less marked when smaller amounts were injected. Intravenous injection of 4 cc. of either Pitocin or Pitressin caused the gland to be more completely drained than normal. Injections of these compounds following fright, injection of adrenalin, or at the end of normal complete milking gave a similar response. It appeared that the effect of Pitressin may have been due to incomplete separation of the two pituitrin fractions. The extra milk removed from the udder following the injection of Pitocin was relatively very high in fat content. The theory is advanced that active oxytocin in the blood caused a high intraglandular pressure which caused the normal "letting down" of milk, while failure to let down milk is similarly due to the presence of adrenalin in the blood.

Some factors involved in efficient milking, K. MILLER and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 225-233, fig. 1).—The effects of various common milking practices on milk and butterfat production were studied. Stripping cows 15 min. after the completion of machine milking had little effect on milk and butterfat production as compared with stripping immediately after the milking machine was removed. Manipulation of the udder 20 min. before milking caused an appreciable decrease in milk and especially of fat productions. When individual quarters were milked successively, there was a progressive decrease in both the amount of milk and of fat which was demonstrated to be due to failure to completely "let down" the milk. Rapid milking was conducive to large milk flow. It is suggested that the lower production due to manipulation of the udder before milking or from a prolonged milking process may be due to dissipation of the oxytocic principle in the blood.

Blood sugar and carbon dioxide combining power of the plasma in relation to ketosis in dairy cattle, J. F. SYKES, C. W. DUNCAN, and C. F. HUFFMAN.

(Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 193-197).—Total ketones, sugar content, and carbon dioxide combining power of the plasma were determined on 456 samples of blood from individual cows which showed strong positive reactions to the test for ketones in the urine. Decreased blood sugar values accompanied ketosis, even when the disorder was not sufficiently severe to be detected by clinical symptoms. The significance of this finding is discussed. No consistent variation in the carbon dioxide combining power of the plasma in relation to ketosis was found. Acidosis was not an invariable accompaniment of ketosis.

A comparison of the different methods of calculating yearly milk and butterfat records, I. MCKELLIP and D. SEATH. (Ohio and La. State Univs.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 181-192).—Using as a standard 100 yearly milk and butterfat records of Holstein and Jersey cows based on actual daily milk weights and 48 butterfat tests at approximately weekly intervals during the year, records computed by various present-day methods were compared. No more accurate results were obtained by the centering-the-testing-day method than by the simple monthly method. Records based on daily milk weights showed less variability when compared with the standard than where daily milk weights were not utilized. Some of the bias occurring when regular testing dates were followed was overcome through a systematic irregularity in testing dates without lowering the degree of correlation with standard records. Records obtained by bimonthly tests and the use of daily milk weights were practically as accurate as those from the monthly and centering methods utilizing daily milk weights. It is suggested that uniform testing rules could be profitably adopted by all parties concerned.

The influence on milk production of a definite time interval for milking cows by machine, A. C. DAHLBERG (*New York State Sta. Bul.* 697 (1941), pp. 13, figs. 2).—Following earlier studies on the influence of milking machines upon milk production (E. S. R., 74, p. 251), experiments were conducted from 1935 to 1939 in which cows were machine-milked within definite time intervals ranging from 4 to over 7 min. per cow. Data presented on the relative effects of hand milking, machine milking (9 to 10 min.), and machine milking (4 to 5 min.) upon the monthly butterfat production and the persistency of production indicate that when the cows were milked by machine in 4 to 5 min., using an electric timer to determine the milking period, production was maintained as uniformly throughout the lactation period as by hand milking. Limited data also indicated less trouble with udder infections when short-time machine milking was employed than under the other plans. It is concluded that milking machines should be removed from the cows promptly after the cow has been milked and that cows can be trained to milk out rapidly without excessive hand stripping. The timer proved to be a very desirable accessory to the milking machine.

[Proceedings of the thirty-second annual convention of the International Association of Milk Dealers] (*Internatl. Assoc. Milk Dealers, Assoc. Buls.* 2 (1939), pp. 45-58; 3, pp. 61-80, figs. 5; 4, pp. 97-117; 5, pp. 121-150, figs. 11; 6, pp. 153-168, figs. 2; 12 (1940), pp. 271-286, figs. 4; 13, pp. 289-314, figs. 4).—The following papers were presented at the meeting held in San Francisco, Calif., October 26-27, 1939: Symposium—Effecting Economies in Plant Operation, Plant Equipment, by G. W. Wilson (pp. 45-50); Refrigeration as Used With Pasteurization, by G. F. Poppensiek (pp. 51-53); Water Conditioning in Milk Plants, by G. A. Richardson (pp. 54-58) (Univ. Calif.); Competition Between Fresh Milk and Canned Milk, by L. Spencer (pp. 61-80) (Cornell Univ.); Microscopic Examination of Pasteurized Milk, by H. Macy (pp. 97-106) (Minn.

Expt. Sta.): Studies on the Structural Aspects of Paraffined Paper Containers, by C. S. Mudge, D. C. Foord, and J. L. Henderson (pp. 107-112) (Univ. Calif.); The Physico-Chemical Principles Involved in Controlling Cream Body, by H. H. Sommer (pp. 113-117) (Univ. Wis.); The American Dairy Science Association's Quality Program for Dairy Products, by W. H. E. Reid (pp. 121-128) (Univ. Mo.); Farm Control of Milk Quality, by E. H. Barger (pp. 129-134); Field Quality Control of Market Milk—Sediment Control, by W. F. Gilpin (pp. 135-140); Electric Dairy Utensil Sterilizers, by B. D. Moses (pp. 141-150) (Univ. Calif.); Rancid-Flavored Milk—Its Cause and Control, by N. P. Tarassuk (pp. 153-160), and The Relation of Metals and Their Alloys to the Flavor of Milk, by C. L. Roadhouse (pp. 161-164) (both Univ. Calif.); How Odors and Flavors in Milk Can Be Controlled by Feeding, by J. A. Emerson (pp. 165-168); The Vitamin C Content of Milk and Its Relation to Oxidized Flavor, by J. L. Henderson (pp. 271-278) (Univ. Calif.); The Effect of Feeding Vitamin A and Carotene to Cows on the Flavor and Color of Their Milk, by W. H. Martin, H. W. Cave, C. H. Whitnah, G. H. Beck, and F. W. Atkeson (pp. 279-286) (Kans. Expt. Sta.); Vitamin A Deficiency in Man—Its Consequences and Methods of Detection, by H. Jeghers (pp. 289-302); and The Importance of Vitamin A in Animal Life and the Effect of Its Deficiency Upon Animals, by G. H. Hart (pp. 303-314) (Univ. Calif.).

Abstracts of papers presented at the forty-second general meeting of the Society of American Bacteriologists] (*Jour. Bact.*, 41 (1941), No. 1, pp. 22, 41, 99-100).—Abstracts are given of the following papers of significance in dairying: The Microbiological Formation of Acetylmethylcarbinol, by M. Silverman and C. H. Werkman (Iowa State Col.); Stimulation of Growth of Lactobacilli by Extracts of *Streptococcus lactis* and *Streptococcus cremoris*, by P. A. Hansen; and The Probable Identity of Dephtheroids Isolated From Aseptically-Drawn Milk With *Corynebacterium bovis* and *Bacterium lipolyticum*, by L. A. Black (Univ. Md.).

[Dairy bacteriology] (*Jour. Bact.*, 41 (1941), No. 2, pp. 271-272, 273-274).—Abstracts of the following papers are given: Mold Mycelia in Butter, by E. T. Mallett; Factors Affecting the Mold Content of Cream, by W. H. Brown and P. R. Elliker (Purdue Univ.); Milk Quality Improvement Without an Ordinance, by G. E. White; and Thermoturcic Bacteria in Pasteurized Milk, by J. L. Hileman.

Proceedings, thirty-first annual meeting, December 5th and 6th, 1939 (*Amer. Butter Inst., Proc. Ann. Mtg.*, 31 (1939), pp. [54], [pls. 3]).—The following papers are published in full: New Aids to Better Cream, by C. H. Parsons; New Developments in Mold Control, by H. Macy (Univ. Minn.); Trouble Shooting for Flavor Defects—Application of Laboratory Findings, by B. W. Hammer (Iowa State Col.); Weedy Flavors—Feeding Experiments, by T. M. Olson (S. Dak. State Col.); Weedy Flavors—Field Observations, by R. V. Hussong; Weedy Flavors—Laboratory Studies, by J. D. Ingle; and Weedy Flavors—Work of the American Dairy Science Association, by P. A. Downs (Univ. Nebr.).

[Abstracts of dissertations on dairy problems] (*Iowa State Col. Jour. Sci.*, 15 (1940), No. 1, pp. 58-59, 72-74, 87-88, 107-110).—Abstracts of the following doctoral theses pertaining to dairy problems are given: Defects of Blue (Roquefort Type) Cheese, by H. W. Bryant; The Fluorescent Bacteria in Dairy Products, by E. R. Garrison; Distribution of *Pseudomonas fragi*, by H. B. Morrison, Jr.; and Effect of Avitaminosis E on Reproduction and Vitamin E Storage in the Tissues and Milk of Goats, by G. K. L. Underbjerg.

In vivo determinations of the hydrogen ion concentration of the vaginas of dairy cows, R. W. DOUGHERTY. (Oreg. Expt. Sta.). (*North Amer. Vet.*, 22 (1941), No. 4, pp. 216-219, figs. 4).—Using a Beckman pH meter with a specially designed glass electrode, in vivo vaginal determinations were made of 400 cows in 15 herds. Readings ranging from pH 5.52 to 8.00 were recorded distributed as follows: 5.52-6.00, 4.75 percent; 6.01-6.50, 29.00 percent; 6.51-7.00, 44.75 percent; 7.01-7.50, 19.75 percent; and 7.51-8.00, 1.75 percent. No correlation was noted between vaginal pH and the extent of breeding troubles.

The reduction of resazurin in milk and aqueous solutions, H. R. THORNTON, F. McCLOURE, and R. B. SANDIN (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. B, pp. 39-48, figs. 4).—Studies at the University of Alberta indicated that the resazurin reduction in milk involves chemical reactions not clearly understood, and further that different lots of commercial resazurin vary greatly in their reaction, some proving unfit for use in a reduction test in milk. The red-blue reaction was electropositive and the red-white reaction electronegative to the methylene blue-methylene white reaction. In good-quality milk the resazurin time potential curve followed the methylene blue curve for the first 2 or 3 hr., but then became strongly poised by the red-white reaction which persisted until reduction to the white compound was completed. It appeared that the color attained at the end of 1 hr. by resazurin in low-bacteria milk depended on the Eh value of the equilibrium set up by the mixing of the reducing systems of the dye and milk, with no evidence that it is related to the number of bacteria in such milk. Intelligent interpretation of the 1-hr. resazurin test was not found to be always possible in the present state of knowledge. It is the authors' opinion that the resazurin test has been placed in the hands of the dairy industry before it has emerged sufficiently from the experimental stage.

The milk clotting enzyme of *Withania coagulans*, K. M. YESHODA (*Cur. Sci. [India]*, 10 (1941), No. 1, pp. 23-24).—An aqueous extract of the partially dried fruit of *W. coagulans* was found to contain an active rennet. By precipitation with ammonium sulfate, centrifuging the precipitate, freeing it from ammonium sulfate, washing with acetone, and drying, a concentrated product was obtained. This preparation was quite stable and was found to exert no proteolytic action. It was only about one-fourth as active as papain and one-fortieth as active as pepsin, 0.125 gm. being capable of bringing about the coagulation of 1 l. of fresh milk in 30 min. at 30° [C.].

Needle puncture method for determination of the bacterial contamination of paraffined milk containers, C. S. MCGEE and D. C. FOORD. (Univ. Calif.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 3, pp. 273-277, fig. 1).—The technic described consists in piercing the sealed paper containers with a No. 20 needle and introducing from 30 to 40 cc. of sterile media into the container, after which the needle is removed and the hole sealed with sterile paraffin. The media is then incubated in situ for 48 hr. at 37° C., after which the container is opened and an observation made as to the presence or absence of growth. Satisfactory results through use of this method are reported.

Oxidized and other flavours in milk, H. BARKWORTH (*Dairy Indus.*, 5 (1940), No. 10, pp. 259-264).—A review, with 60 references.

Frozen cream: A review, C. D. DAHLE. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 245-264).—The principal topics covered are the effect of freezing cream on physical properties, the use of frozen cream in ice cream, factors affecting the keeping quality of frozen cream, and substances responsible for oxidized flavor in frozen cream. Reference is made to 69 articles.

The rabbit defect of butter, E. G. PONT (*Jour. Council Sci. and Indus. Res. [Austral.]*, 14 (1941), No. 1, pp. 1-10).—The distribution, occurrence, and nature of this defect are discussed, with particular reference to the similarity between this defect and the putrid or surface taint defect in Canadian and United States butters. *Achromobacter putrefaciens* has been found to be generally associated with the development of this condition, while other undescribed organisms have been encountered which are capable of reproducing the taint in experimental butters. Contaminated water supplies are regarded as the principal source of infection in creameries, while churns and other equipment may become important foci of infection. Heavy salting, relatively high acidities, thorough working, and efficient manufacture generally assist in minimizing or controlling the defect. Points not clearly understood are the irregular and spasmodic manner of occurrence, the fleeting and transient nature of the characteristic aroma, the difficulty in defining and eliminating sources of infection, the marked effect on quality of apparently small numbers of the causal organisms, and the development of the organisms concerned, together with the characteristic taint in relation to the air content of the butter. Twenty references are cited.

The "rabbito" defect in butter, A. G. F. ITZEROTT (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 1, pp. 39-42).—A summary of known facts relating to the problem, with particular emphasis on methods of control.

Water supplies in relation to surface taint in butter, J. B. LINNEBOE (*Sci. Agr.*, 21 (1940), No. 3, pp. 133-138).—This contribution from the Department of Agriculture, Alberta, indicates that over a 14-yr. period, surface-tainted butter constituted from 0.09 to 0.65 percent of the total butter graded, with evidence that *Achromobacter putrefaciens* is a primary causative factor for this defect. A survey showed 14 of 52 creamery water supplies and 6 of 55 farm waters to contain this organism. It is further indicated that the occasional passing of contaminated water through the regular water lines constitutes a possible source of contamination of creamery water supplies with organisms of this type. The ordinary public health bacterial analyses did not necessarily indicate the suitability of a water for creamery purposes.

The influence of fat on the quality, composition, and yield of cream cheese, Z. D. ROUNDY and W. V. PRICE. (Univ. Wis.). (*Jour. Dairy Sci.*, 24 (1941), No. 3, pp. 235-243, figs. 6).—Employing a standard manufacturing procedure, as described, experimental batches of cream cheese were made from creams containing 8, 10, 12, 14, 16, 18, 20, and 22 percent butterfat. The flavor of the resulting cheese was less affected by the fat content of the cream than were body and texture. High-testing cream produced cheese that was sometimes criticized for having too much fat, while that from the low-testing cream lacked the rich, pleasant flavor of milk fat. Lowering the fat content tended increasingly to cause grainy texture and crumbly body, while increasing the fat tended to cause excessive smoothness and stickiness. It is concluded that good-quality cheese can be made from cream containing from 16 to 20 percent fat. Such cheese will contain from 37 to 42 percent fat and from 50 to 54 percent moisture. As the fat content of the cream increases, the yield of cheese per 100 lb. of cream increases, but the yield per pound of fat in the cream decreases.

Studies on bacteriophage in relation to Cheddar cheesemaking, C. K. JOHNS and H. KATZNELSON (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. C, pp. 49-58, pl. 1).—This report from the Canadian Department of Agriculture describes the sudden stoppage of acid development in experimental vats of Cheddar cheese which proved to be due to the activity of a polyvalent streptococcal phage. The

mixture of organisms introduced through the starter was as completely destroyed as in cases in which single-strain starters were employed. The ability of an active phage filtrate to stop acid production in the cheese vat was demonstrated experimentally. The presence of phage in the starter could not be demonstrated, suggesting outside contamination. However, tests on milk of individual cows, composite herd samples, stable and laboratory air, and rennet extract failed to indicate specifically the origin of the lytic agent.

The correct branding for cheese and for cheese boxes (*Canada Dept. Agr. Pub. 711 (1940), pp. 3, figs. 2*).—Designs illustrating the correct method of branding cheese and cheese boxes under the Dairy Industry Act of Canada are presented.

Shrinkage, W. C. COLE. (Univ. Calif.). (*Ice Cream Field, 34 (1939), No. 4, pp. 32-34, figs. 4*).—By experimentally subjecting ice creams to reduced pressures ranging from 0 to 20 in. of vacuum, it was found that variations in the external pressure may cause marked changes in the volume of ice cream. The volume increased as the pressure was reduced, but when the pressure was again increased to its original value ordinarily the ice cream did not return to its original volume, due to the loss of air. Shrinkage in ice cream subjected to marked changes in altitude is explained on this basis. The hardness of ice cream as affected by temperature largely determined the extent of shrinkage. Other things being equal, the harder the ice cream the less was the change in volume as a result of variations in pressure.

Mix stabilizers, P. H. TRACY. (Univ. Ill.). (*Ice Cream Rev., 24, 1941, No. 8, pp. 44, 92-94*).—A general discussion of the properties of commonly used ice cream stabilizing agents.

VETERINARY MEDICINE

Veterinary obstetrics, W. L. WILLIAMS (*Ithaca, N. Y.: Author, 1940, 3 ea., pp. XVII+466, pls. 4, figs. 105*).—In the preparation of the present edition of this work (*El. S. B., 66, p. 867*) an effort has been made to strengthen the view advanced by the author in 1931 that dystocia and allied phenomena are the logical consequences of errors in animal husbandry, are predictable, and are preventable. Recent researches are considered to have made it apparent that the pathological phenomena of reproduction are clearly and authentically registered in macroscopic lesions of the fetal membranes, fetus, and uterus.

Accessory-growth-factor requirements of *Brucella*, S. A. KOSER, B. B. BRESLOVE, and A. DORFMAN (*Jour. Bact., 41 (1941), No. 1, pp. 37-38*).—A study of the accessory factors, when added singly and in various combinations, demonstrated that nicotinamide and thiamin were required for growth of four of the eight cultures of *Brucella* that were unable to grow in an amino acid-glucose-salt medium, while pantothenic acid accelerated growth. Continued growth through repeated transplants was possible in the presence of combinations of nicotinamide and thiamin, or nicotinamide, thiamin, and pantothenic acid, but was not possible in the presence of nicotinamide, thiamin, or pantothenic acid when added separately, or in combinations of nicotinamide and pantothenic acid or thiamin and pantothenic acid. Of the remaining four cultures that failed to develop in the presence of the original mixture of accessory factors, additional evidence has shown that one probably requires biotin, as well as nicotinamide, thiamin, and pantothenic acid. The exact requirements of the remaining three cultures are not known.

A relationship was found between the concentration of salt in the basal medium and growth of the organisms. Without added sodium chloride, growth

did not appear even in the presence of proper accessory substances. Addition of sodium chloride, in the presence of proper accessories, resulted in the development of cultures with optimal growth at 0.8 to 1 percent. Sodium sulfate, potassium chloride, and potassium sulfate, in concentrations equivalent to that of 0.8 percent of sodium chloride, produced the same effect on growth.

Studies with a biologically active carbohydrate from *Brucella*, R. L. LIBBY and A. L. JOYNER (*Jour. Bact.*, 41 (1941), No. 1, pp. 70-71).

Studies on influenza virus: The complement-fixing antigen of influenza A and swine influenza viruses, E. H. LENNETTE and F. L. HORSFALL, JR. (*Jour. Expt. Med.*, 73 (1941), No. 5, pp. 581-599).—Report is made of influenza complement-fixation tests designed for use with ferret serum. Complement-fixing antigens derived from influenza ferret lungs were unsatisfactory due to their low content of soluble antigen; those prepared from mouse lungs or developing chick embryo membranes proved to be better antigenically, and were reliable when the various reagents in the test were properly adjusted to eliminate non-specific fixation of complement. The results of cross complement fixation tests indicated that the soluble antigens of the PR8 and W. S. strains of influenza A virus were closely similar, if not identical. They indicated also that the soluble antigen of swine virus possessed components present in the antigens of the human strains of virus.

The identification of *Erysipelothrix* and its relation to *Listerella*, L. A. JULIANELLE (*Jour. Bact.*, 41 (1941), No. 1, pp. 44-45).—None of the 13 strains of *Erysipelothrix* studied, when inoculated conjunctively by instillation or swabbing, induced the corneal responses that result in similar infection by *Listeria*. As measured by agglutination, *Erysipelothrix* appeared to be a single group antigenically, differing from the 2 immunological types of *Listeria*.

Some biochemical reactions of the *Listerella* group, P. C. HARVEY and J. E. FABER. (Univ. Md.). (*Jour. Bact.*, 41 (1941), No. 1, pp. 45-46).—Report is made of 50 strains of organism of the genus *Listeria* that were studied with regard to their biochemical activities.

Accessory-growth-factor requirements of the genus *Pasteurella*, S. BERKMAN and S. A. KOSEK (*Jour. Bact.*, 41 (1941), No. 1, pp. 38-39).

A comparative study of the nutritional requirements of *Salmonella typhosa*, *Salmonella pullorum*, and *Salmonella gallinarum*, E. A. JOHNSON and L. F. RETTGER (*Jour. Bact.*, 41 (1941), No. 1, pp. 41-42).—Report is made of an investigation conducted mainly with a view to determining possible nutritional differences between *S. pullorum* and *S. gallinarum*, which are alike antigenically and various investigators have regarded as the same organism.

The basal medium was composed of 16 amino acids and a reducing agent (thioglycolic acid). It was suitably buffered according to the technic of Fildes and Knight. Forty-five out of 48 strains of *S. pullorum* grew in this medium without the addition of any accessory growth factors, with the exception of 2 strains which required nicotinic acid. On the other hand, 22 out of 27 strains of *S. gallinarum* grew on this basal medium, 14 of them only when vitamin B₁ was present, and 8 when there was present vitamin B₁ and 10 percent of carbon dioxide.

The eight strains of *S. typhosa* studied thus far required tryptophane in the basal medium, a result that is in harmony with the observations of Burrows. For *S. pullorum* and *S. gallinarum* this amino acid was dispensable. This finding serves further to distinguish *S. typhosa* from *S. pullorum* and *S. gallinarum*.

The production of large amounts of a polysaccharid by *Streptococcus salivarius*, C. F. NIVEN, JR., K. L. SMILEY, and J. M. SHERMAN. (Cornell Univ.). (*Jour. Bact.*, 41 (1941), No. 4, pp. 479-484, fig. 1).

Virulence of *Salmonella typhimurium*, I, II (*Jour. Bact.*, 40 (1940), No. 2, pp. 171-195, figs. 2; pp. 197-214).—The first part of this contribution, by R. M. Pike and G. M. Mackenzie, is an analysis of experimental infection in mice with *S. typhimurium* strains of high and low virulence, and the second part, by Mackenzie, Pike, and R. E. Swinney, a report of studies of the polysaccharide antigens of virulent and avirulent strains. Lists of 27 and 29 references, respectively, are included.

A simple method of removing bacteria that adhere to trichina larvae, J. L. AVERY. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 6-7, fig. 1).

The relation of the size and shape of the tuberculin molecule to its intracutaneous potency, D. W. WATSON and J. McCARTER. (Univ. Wis.). (*Jour. Bact.*, 41 (1941), No. 1, p. 62).

The chemistry and toxicity of selenium compounds, with special reference to the selenium problem, E. P. PAINTER. (N. Dak. Expt. Sta. and Univ. Minn.). (*Chem. Rev.*, 28 (1941), No. 2, pp. 179-213).—This comprehensive review, with 186 references to the literature, gives a brief historical survey of the selenium problem in agriculture, and in connection with this problem considers the toxicity of selenium, selenium in soils and plants, and the relationship between selenium and sulfur in plants. Methods of analysis, the organic compounds of selenium, and the properties of selenium in plants and their relation to known compounds of selenium and sulfur are also discussed at length.

The mode of action of sulphanilamide, A. T. FULLER, L. COLEBROOK, and W. R. MAXTED (*Jour. Pathol. and Bact.*, 51 (1940), No. 1, pp. 105-125).—This discussion is presented with a list of 31 references to the literature cited.

Derris root infusion for psoroptic scabies in horses and carabaos, R. B. GAPUZ (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 5, pp. 409-418).—In six experiments with horses and two with carabaos, infusions of crushed fresh and dried roots of derris were found effective against equine and bovine scabies. A slight case of horse scabies yielded to one application of an infusion of dry roots with a concentration of 0.6 percent; moderate to severe cases, to 2.5-percent infusion of fresh roots applied twice at an interval of 1 day. Stronger solutions were very effective. Dry root infusion, 1 percent in strength, cured carabao scabies when applied twice but failed when applied only once. A weaker solution, 0.6 percent, even when applied twice, was found unsatisfactory.

Derris root infusion as a tickicide for cattle and horses, R. B. GAPUZ (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 5, pp. 431-437).—In the experiments conducted infusions of crushed dry derris roots varying in concentration from 1.25 to 5 percent were found destructive against ticks on cattle and horses. The infusions were applied but once, the smaller ticks having succumbed in 24 hr. and the larger ones in 48 hr.

Observations of Aujeszky's disease (mad itch) in the State of Minas Geraes [trans. title], N. GIOVINE and A. MACHADO (*Ceres [Minus Geraes]*, 1 (1940), No. 5, pp. 366-397, figs. 13; *Eng. abs.*, pp. 391-393).—Studies of 20 cases of Aujeszky's disease in bovines from rural establishments in the State of Minas Geraes, Brazil, are reported.

Bang disease.—Preliminary report of calfhooed vaccination, M. F. BARNES (*Jour. Bact.*, 40 (1940), No. 2, pp. 328-329).—This is an abstract of a discussion presented on the basis of a preliminary report representing a summary for a 5-yr. period, terminating January 1, 1940, of experimental calfhooed vaccination in one herd and reference to surface information in a second herd, the results of which have not been summarized. The vaccine used was a living culture prepared from *Brucella abortus* U. S. strain 19. No definite conclusions were drawn

because of the small number of animals involved, but it is indicated that under limited conditions with proper definition calfhood vaccination in certain infected herds can be used as a valuable adjunct in the control and elimination of Bang's disease.

Bovine coccidiosis treated with sulfanilamide, R. McPECK and F. E. ARMSTRONG. (Kans. State Col.). (*Vet. Med.*, 36 (1941), No. 4, pp. 199-201, figs. 2).—In a limited number of cases treated, the authors found that sulfanilamide had a marked effect upon *Eimeria zurni* infection of calves. The oocysts disappeared from the feces of animals with both clinical and subclinical infections after three or four days of treatment with this drug. To be effective it was necessary to maintain the sulfanilamide constantly in the body during that period.

Contagious streptococcal mastitis of cattle: Possible extension of field control on a national scale and the role of the practitioner, P. S. WATTS (*Vet. Rec.*, 53 (1941), No. 5, pp. 61-66).

Beta-hemolytic Lancefield group C streptococcus in bovine mastitis, V. D. FOLTZ. (Kans. Expt. Sta.). (*Jour. Bact.*, 40 (1940), No. 2, pp. 331-332).—Report is made of the results of examinations of quarter samples of milk from the cows of a small farm dairy made in an effort to determine the source of an epidemic of septic sore throat. One cow was discovered infected in one quarter with a beta-hemolytic Lancefield group C streptococcus, while the other three quarters appeared to be normal. Sulfanilamide, the treatment with which for this type of infection in the bovine had never been attempted, "was administered by mouth in sufficient dosage to keep the blood level of the drug near 6 mg. percent for a period of 10 days. The logarithmic average number of beta-hemolytic streptococci per milliliter [of] milk from the infected quarter before, during, and after treatment was 45,800, 17,500, and 55,000, respectively. Leucocytes per milliliter of milk averaged 11,500,000 before, 1,621,000 during, and 2,282,000 after treatment. Composite samples of the three normal quarters gave the same general curve of fall and rise in leucocyte numbers but of a lower magnitude. A microscopic examination of incubated samples of milk by the Breed technic was made to detect the presence of long-chained streptococci. Milk from the infected quarter was consistently positive for long-chained streptococci before treatment and until the blood level of sulfanilamide reached 6.5 mg. percent. During the period of treatment, 10 days, this test was consistently negative, with one exception, until the blood level of the drug fell to zero; then the test again became positive. This is probably due to the bacteriostatic action of the sulfanilamide in vitro, a point which has led to erroneous conclusions by other workers. The Hotis test was consistently negative throughout this experiment, indicating that this test was valueless in detecting this infection."

Isolation and characteristics of bacteriophages for staphylococci of bovine mastitis, L. W. SLANETZ and E. JAWETZ. (N. H. Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 4, pp. 447-455).—The results of experiments regarding the isolation of staphylococcus bacteriophages from milk and the morphology, specificity, and potency thereof as compared to phages from human sources are reported. A method for such isolation was developed. Samples from 7 of 20 cows shedding staphylococci in the milk contained phage. The bovine staphylococcus phages isolated resembled the phages from human sources in many respects. Like the human phages they were, with one possible exception, single type, polyvalent phages producing small sharp-edged circular plaques. The plaque size and a certain heat lability of some of them were the only noticeable differences. All attempts to show specificity of lysis failed completely, the conclusion being that staphylococci occurring as human and animal pathogens are very closely related and cannot be distinguished by means of selective bacteriophage action. There

was no correlation between susceptibility to lysis and biochemical or toxin-producing characteristics. A pour plate method was developed employing low concentrations of agar which facilitated the counting and morphological study of phage plaques. Animal experiments demonstrated the effects of phage therapy under varying conditions. The role of bacteriophage in resistance to bovine staphylococcal mastitis is discussed.

An outbreak of pneumonia in calves due to *Staphylococcus pyogenes aureus*, J. B. TURR (*Vet. Rec.*, 53 (1941), No. 6, pp. 84-85).

Trembles (milk sickness) produced by toxic butter, J. F. COTCH. (U. S. D. A.). (*Vet. Med.*, 36 (1941), No. 5, pp. 244-245).—Report is made of a case of trembles, or milk sickness, produced under laboratory conditions in a healthy sheep by feeding butter made from the milk of cows feeding on rayless goldenrod (*Aplopappus heterophyllus*). A chemical examination of the butter revealed the absence of tremetol as such and indicated that this poison had been converted into a toxic substance of acid properties by the cow's metabolism.

The comparative values of certain mediums for the isolation of bovine tubercle bacilli, A. G. KARLSON (*Jour. Infect. Diseases*, 67 (1940), No. 1, pp. 1-4).—In the course of some bovine tuberculosis studies tuberculosis lesions from naturally infected cattle were cultured on glycerinated and nonglycerinated forms of four media. Bovine tubercle bacilli were isolated on the media not containing glycerin more frequently than on media containing it, and the colonies were larger and appeared about a week earlier. A medium made by adding the yolk of one egg to 150 cc. of melted and cooled beef extract agar gave satisfactory results, but there was no advantage in using potato extract or meat infusion for the agar base. Since glycerin is demonstrated to inhibit the development of the bovine tubercle bacillus on original isolation, it is recommended that nonglycerinated media as well as glycerinated be used in attempting isolation of tubercle bacilli from materials which might contain the bovine type of the tubercle bacillus.

Field trials on the use of phenothiazine against worms in sheep, D. ROBERTSON (*Vet. Rec.*, 53 (1941), No. 4, pp. 47-49).—In the experiments reported phenothiazine administered in tablet form at a dose rate of 0.1 gm. per pound of body weight had no effect on worms in the fourth stomach of lambs. Phenothiazine in liquid form administered at the rate of 0.25 gm. per pound of body weight to ewes heavily infested with *Chabertia ovina* showed an average increase of 7.5 lb. per head over a period of 2 mo. and a marked reduction in the number of worms. Given at the rate of 0.5 gm. per pound of body weight to ewes showing advanced symptoms of chabertiosis, an average increase in live weight of 0.5 lb. per day was obtained for a period of 2 mo. and a marked reduction in the egg counts.

The production of immunity against *Cl[ostidium] welchii* type D (enterotoxaemia), M. B. BUNDLE (*Austral. Vet. Jour.*, 17 (1941), No. 1, pp. 3-11).—Of the vaccines tested, the highest degree of passive transmitted immunity produced in lambs followed the prenatal vaccination of the ewes with reinforced alum-precipitated toxoid. It is shown that the enhanced antigenic value of this product is due to the equal influence of alum precipitation and increased antigenic content, both alum-precipitated toxoid and reinforced toxoid being superior antigenically to simple toxoid. Alum-precipitated toxoid was superior as an antigen to zinc chloride-precipitated toxoid. Inoculation by the intraperitoneal route did not produce a significantly higher antigenic response than by the subcutaneous. Lambs from vaccinated dams do not respond as satisfactorily to active immunization as lambs which have not possessed passive transmitted immunity.

Tissue changes in white-tailed deer (*Odocoileus virginianus borealis*) accompanying natural infections of lungworms (genera *Protostrongylus* and *Dictyocaulus*), F. C. GOBLE (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 141-158, pls. 6).—This contribution is presented with a list of 33 references to the literature.

Swine influenza, J. P. SCOTT (*Jour. Bact.*, 40 (1940), No. 2, p. 327).—Egg-passage virus of swine influenza was found highly virulent for mice and pigs up to the fiftieth passage, but the eighty-fifth and later passages were nonvirulent for these animals. Neutralization of virus by antiserum was readily demonstrated in the developing chick embryo. "Mice infected with swine influenza virus developed lung lesions in 3 days; passage at 48-hr. intervals increased the virulence of swine influenza virus strains. Fourteen strains of swine influenza virus showed no differences in cross immunity and serum protection tests. *Pasteurella suisepitica* cultures were nonpathogenic for pigs but activated swine influenza virus producing a noncontagious infection. Untreated and formalized egg-passage virus produced a solid immunity in mice and caused some increase in resistance in pigs to experimental infection. Swine influenza virus was isolated from the blood of pigs 10 to 34 days after experimental infection. A carrier state is suggested by the development of immunity in pigs placed in contact with recovered animals and the spontaneous development of swine influenza in pigs 3 mo. after recovery from experimental infection."

Results of intracutaneous tests for the detection of trichina infections in swine, L. A. SPINDLER, S. X. CROSS, and J. L. AVERY. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 1-5).—The results of 12,435 intracutaneous tests made with various antigens for the detection of trichina infections in swine are summarized. "In the total series of 1,482 tests on infected hogs clear-cut positive reactions were obtained in only 42.78 percent; in 36.09 percent no reactions were apparent. Of 10,953 tests on swine later shown to be uninfected, 71.15 percent were negative but positive reactions occurred in 17.51 percent. A description is given of a method of preparing an antigen designated as number 165. This antigen is composed of bodies of trichina larvae ground to a particulate condition; this particulate material is suspended in diluent for the tests. Results of tests with antigen 165 are compared with results of tests using a saline extract of dried powdered trichina larvae; these tests were all made on hogs in abattoirs. In the total series of tests involving antigen 165 the condition as regards trichina infections was correctly diagnosed in approximately 71 percent. Using the saline extract of dried powdered larvae the condition as regards trichina infection was correctly diagnosed in approximately 53 percent. In the total series of injections of control diluents distinct positive reactions occurred in 4.76 percent. All these occurred in one series of tests and the cause has not been determined."

Influence of pH on the molecular stability of the equine encephalomyelitis virus protein (eastern strain), A. R. TAYLOR, D. G. SHARP, and J. W. BEARD (*Jour. Infect. Diseases*, 67 (1940), No. 1, pp. 59-66, figs. 5).

The infection of birds with the virus of equine encephalomyelitis, A. W. SELLARDS, E. E. TYZZER, and B. L. BENNETT (*Amer. Jour. Hyg.*, 33 (1941), No. 2, Sect. B, pp. 63-68).—The virus of equine encephalomyelitis recovered from pheasants dying in Connecticut was found by the authors to conform in its various characteristics with an eastern equine strain without evidence of any peculiarities attributable to its avian origin. A fatal paralysis developed in several adult pheasants after intramuscular injection. Very young chicks died within 48 hr. after subcutaneous injection. Young hens remained free of symptoms even after subcutaneous inoculation, but their serum developed protective properties. A list of 15 references to the literature is included.

The transmission of equine encephalomyelitis to the western burrowing owl (*Speotyto cunicularia hypogaea* (Bonaparte)), J. T. SYVERTON and G. P. BERRY (*Amer. Jour. Hyg.*, 33 (1941), No. 2, Sect. B, pp. 37-41, fig. 1).—Experimental evidence is presented to show that a raptorial bird, the western burrowing owl or ground owl, is readily susceptible to infection by the virus of equine encephalomyelitis, both eastern and western types. A list is given of 13 references to the literature. In an appended note reference is made to other records of the susceptibility of birds to this virus.

Repeated vaccination of man against the virus of equine encephalomyelitis, D. BEARD, H. FINKELSTEIN, and J. W. BEARD (*Jour. Immunol.*, 40 (1941), No. 4, pp. 497-507).—Report is made of a study of the content of neutralizing antibodies in the serum of man following primary vaccination against the eastern and western strains of virus of equine encephalomyelitis.

Treatment of experimental equine encephalomyelitis with hyperimmune rabbit serum, J. ZICHIS and H. J. SHAUGHNESSY (*Jour. Bact.*, 41 (1941), No. 1, pp. 52-53).—The authors' histopathological studies of the brains of guinea pigs successfully treated with hyperimmune rabbit serum (western type equine encephalomyelitis virus) after they were visibly ill revealed that widespread damage of the tissues of the central nervous system had occurred, but that the inflammatory reaction and destructive changes were receding when the animals were killed.

Swiss mice were treated by the intraperitoneal injection of serum 48 hr. after an intracerebral injection of the virus and at a time when they showed signs of infection. Guinea pigs were similarly treated at the onset of fever and at a time when they were visibly ill. The majority of the animals treated at these stages of the disease recovered, whereas all the untreated controls died.

Notes on the survival of infective horse strongyle larvae, J. T. LUCKER (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 11-13).—Report is made of a preliminary experiment designed to test the influence of temperature on the life span of infective horse strongyle larvae.

Critical tests with phenothiazine as an anthelmintic in horses, R. T. HABERMANN, P. D. HARWOOD, and W. H. HUNT. (U. S. D. A.). (*North Amer. Vet.*, 22 (1941), No. 2, pp. 85-92).—Findings as to the efficacy of phenothiazine for the removal of nematodes from the intestinal tract of equines are reported, the details being given in tables. In doses of from 50 to 100 gm., more than 99 percent of 362,000 cylicostomes, 96 percent of 137 *Strongylus* spp., and 72 percent of 40 *Parascaris equorum* were removed from 10 horses and 1 mule. The drug was ineffective for the removal of *Oxyuris* sp., bots, and possibly *Habronema muscae*. The therapeutic dose recommended is 50 gm. per equine. It is possible that the therapeutic dose might be reduced further, perhaps to 30 gm., when additional critical data on this point become available. Three horses exhibited no significant symptoms following the administration of 500 gm. of phenothiazine. Therefore, the therapeutic index is greater than 10:1. A second large dose of 500 gm. given to 1 of the horses, 43 days after the first dosing, failed to produce alarming symptoms, but a dose of 1,000 gm. proved fatal to 2 horses. Methods of administering phenothiazine by capsule, by stomach tube, or by mixing with feed are described.

Phenothiazine as an equine anthelmintic, B. J. EBBINGTON. (Ky. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 4, pp. 188-193, figs. 2).—In further experimental use of phenothiazine (*U. S. R.*, 85, p. 112) and work by others in the Kentucky Station area, phenothiazine has been found very effective in the removal of mature strongyles from horses. It is pointed out that this drug should not be classed as nontoxic. Anemia, albuminuria, and hemoglobinuria have been found following the administration of phenothiazine to horses in the recom-

mended therapeutic doses. The size and frequency of the dose are involved in the symptoms produced. Age and pregnancy are other factors which appear to deserve consideration.

Rickets in silver fox pups, G. L. OTT and A. I. COOMBS. (Wis. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 4, pp. 202-205, figs. 3).—A report is made of the experimental production of rickets in silver fox pups, including data on the symptoms observed, chemical analyses of the blood for serum calcium and inorganic phosphorus content, and the total ash content of the bones. Foxes receiving a vitamin D-low basal ration supplemented with calcium carbonate in amounts sufficient to create a calcium-phosphorus ratio in their diet of 7 to 1 clearly showed rachitic symptoms. Foxes receiving the same vitamin D-low basal ration supplemented with calcium carbonate and secondary potassium phosphate in amounts sufficient to have seven times the normal dietary content of these two elements present, yet in the same ratio to one another as in the basal diet (1.32 to 1), showed no rachitic symptoms and appeared normal in every respect.

Studies on the normal bactericidins of the domestic fowl, D. R. BAHLER, S. S. HODES and S. E. HARTSELL. (Purdue Univ.). (*Jour. Bact.*, 41 (1941), No. 1, pp. 102-103).

The distribution of avian malaria parasites (*Plasmodium* relictum and *P. cathemerium*) in visceral organs as compared with the peripheral blood, R. HEWITT (*Amer. Jour. Hyg.*, 33 (1941), No. 2, Sect. C, pp. 54-68, figs. 3).

Studies on *Plasmodium lophurae*, a malarial parasite in fowls.—II, Pathology and the effects of experimental conditions, L. A. TERZIAN (*Amer. Jour. Hyg.*, 33 (1941), No. 2, Sect. C, pp. 33-53, figs. 3).—The pathology, blood changes, and splenomegaly in chicks infected with *P. lophurae*, the influence of various factors on the course of infections, and the effects of phenylhydrazine hydrochloride in chicks infected with this parasite are reported in this continuation of the author's investigation (*El. S. R.*, 84, p. 821).

Cultivation of the agent of fowl leukosis in vitro, L. DOLJANSKI and M. PIKOVSKI (*Nature [London]*, 146 (1940), No. 3696, pp. 302-303).—A brief account of the cultivation of the causative agent of fowl leucosis in the presence of normal cells proliferating in vitro.

Coccidiosis in the brooder house, E. M. DICKINSON. (Oreg. Expt. Sta.). (*Nulaid News*, 19 (1941), No. 1, pp. 8-9).

Comparison of the whole blood and tube agglutination tests for pullorum disease, R. GWATKIN, I. W. MOYNIHAN, C. W. TRAVIS, and W. ROACH (*Sci. Agr.*, 21 (1941), No. 6, pp. 335-349).—A report is made of comparative tests for *Salmonella pullorum* by the whole blood and tube agglutination methods conducted on two groups of birds in 1939-40. Twenty-eight citations are included.

There were 2,926 diagnoses made on the birds in 13 flocks in group 1, and retests were made on 935 birds in 7 flocks. The total of 3,861 diagnoses was made by both tests and with an agreement of 92.41 percent. Constancy of diagnosis from first to second test was 89.79 percent for the whole blood test and 87.07 percent for the tube test.

In the second group, 1,324 tests were made by whole blood and tube tests, there being an agreement of 94.18 percent. Retests were made on 1,658 birds (some were not tested by the tube method on first test on account of spoiled samples), and an agreement of 93.66 percent was secured. The combined diagnosis of both tests by both methods showed an agreement of 93.89 percent. Retests on 1,670 birds by the whole blood test gave a constancy of diagnosis of 95.2 percent, while retests on 1,267 birds by the tube method gave a constancy of diagnosis of 97.7 percent. The whole blood test showed more positives than the

tube method in each group. Bacteriological examination of 12 birds positive by the whole blood method only, on the first test, yielded *S. pullorum* from 1 bird (8.3 percent), while the organism was recovered from 2 out of 5 (40 percent) that were positive to the tube only. A member of the coli-aerogenes group was isolated from 1 bird positive to the whole blood test only.

The results obtained suggest that the whole blood test, in competent hands, could be used in a program of pullorum control with results as satisfactory as those obtained by the tube method, under the weather conditions and transportation difficulties often prevailing during the testing season in Alberta. The whole blood test has the advantage of being more economical.

The eradication of pullorum disease by the rapid whole blood stained antigen agglutination test, T. G. HUNGERFORD (*Austral. Vet. Jour.*, 17 (1941), No. 1, pp. 11-15).—Account is given of the efficacy of the rapid agglutination test in the eradication of pullorum disease as demonstrated in New South Wales on a poultry farm carrying from two to three thousand Langshans.

Botulism in ducks along Laguna de Bay, J. D. GENEROSO and F. SAN AGUSTIN (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 5, pp. 419-430).—An outbreak of botulism that occurred among ducks along the towns bordering Laguna de Bay, Luzon, in 1936 and 1937 is reported. The source of the outbreak was traced to the polluted lake water which is frequented by ducks on the bordering towns. It occurs concomitantly with the presence of decaying algae on the lake. Immunobiological studies indicated that the infection was of the A type of botulism. Preliminary attempts at immunization revealed the antigenic value of formalin-treated toxin in tests with guinea pigs.

Blood parasites of some Maine waterfowl, E. C. NELSON and J. S. GASHWILER (Univ. Maine et al.). *Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 199-205).—Report is made of the results of examinations of blood smears obtained from 130 waterfowl of nine species. Blood parasites were found in the wood duck (*Aix sponsa*), black duck (*Anas rubripes*), ring-necked duck (*Nyroca collaris*), American merganser (*Mergus merganser americanus*), American golden-eye (*Glaucionetta clangula americana*), hooded merganser (*Lophodytes cucullatus*), green-winged teal (*Nettion carolinense*), and coot (*Fulica americana*). No parasites were found in two lesser scaup ducks (*Nyroca affinis*).

A technique for removing lead from the gizzards of living waterfowl, W. H. NOB. (Minn. Expt. Sta.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 175-179, pl. 1, fig. 1).

Some parasites newly recorded for the ruffed grouse, *Bonasa umbellus*, in the United States, J. F. MUELLER (*Helminthol. Soc. Wash. Proc.*, 8 (1941), No. 1, pp. 14-15).—In the course of a study of parasites and disease in ruffed grouse in New Hampshire during the summer of 1940, 46 birds were examined. While the search for intestinal and blood protozoans was relatively inadequate, a thorough examination was made of the organs for other internal and external parasites. Eight species of worms were found, including three trematodes, *Leucochloridium pricei* McIntosh, *Harmostomum pellucidum* Werby, and *Prosthogonimus macrorchis* Macy; three cestodes, *Darainea proglottina* Blanchard, *Hymenolepis carioca* Magalhaes, and *Railletina tetragona* Molin; and two nematodes, *Ascaridia bonasae* Wehr and *Cheilosporira spinosa* Cram.

Notes on the endoparasites of Wisconsin pinnated and sharp-tailed grouse, B. B. MORGAN and F. N. HAMERSTROM, JR. (Univ. Wis.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 2, pp. 194-198).—Report is made of the results of examinations of 128 sharp-tailed grouse (*Pediocetes phasianellus campestris*) and 52 prairie chickens (*Tympanuchus cupido americanus*) in Wisconsin for endoparasites. Nematodes found in prairie chickens included *Seurocyrnea colini* (gizzard),

Heterakis gallinae (ceca), *Capillaria contorta* (crop), *Capillaria* sp. (crop), and *Ascaridia lineata* (small intestine). Nematodes found in sharp-tailed grouse included the above-mentioned parasites and in addition *Cheilosporira spinosa* (gizzard) and *Subulura strongylina* (ceca). Tapeworms recorded in this survey from prairie chickens and sharp-tailed grouse were *Rhabdometra nullicollis* and *Choanotaenia infundibulum*. Several species of coccidia were found by fecal examination in both prairie chickens and sharp-tailed grouse.

Aspergillosis in wild herring gulls, W. A. DAVIS and L. S. McCLUNG (*Jour. Bact.*, 40 (1940), No. 2, pp. 321-323, fig. 1).—Although pulmonary infections with *Aspergillus fumigatus* are well known in domestic fowls or wild birds confined in zoological gardens, the occurrence of such infection in wild herring gulls (*Larus argentatus smithsonianus*), here noted, is considered worthy of particular mention. During October 1939 these gulls in the region of the East Boston, Mass., airport were afflicted with this fatal disease, an investigation of the area revealing the presence of some 20 dead gulls and a flock of about 200 live birds. An official reported that more than 60 birds which were dead of moribund had been removed from that area.

The occurrence of Hexamita (Octomitus) columbae in pigeons in California, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Jour. Parasitol.*, 27 (1941), No. 2, pp. 185-187).—Four cases of intestinal parasitism of pigeons by *H. columbae* reported from California are thought to be the first to be recorded from pigeons in the United States.

Variation in a new species of cestode, Raillietina (Skrjabinia) variabilis, from the prairie chicken in Illinois, W. H. LEIGH (*Jour. Parasitol.*, 27 (1941), No. 2, pp. 97-106, figs. 18).—Under the name *R. variabilis* a new cestode is described, it being the first species of the genus recorded from the prairie chicken. This species was found in 10 of 14 young prairie chickens collected in two adjacent Illinois counties. In 4 cases the infestations were so intense as to occlude the lumen of the small intestine.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1938, part 1; 1939, parts 9, 11, 12, 13, 14 (*U. S. Geol. Survey, Water-Supply Papers 851* (1940), pp. IX+496, pl. 1; 879, pp. VII+309, pl. 1; 881, pp. XII+446, pls. 2; 882, pp. VII+246, pl. 1; 883, pp. VIII+315, pl. 1; 884, pp. VII+220, pl. 1).—These papers record measurements of stream flow, No. 851 covering the North Atlantic slope basins, for the year ended September 30, 1938; and No. 879 covering the Colorado River Basin, No. 881 the Pacific slope basins in California, No. 882 the Pacific slope basins in Washington and upper Columbia River Basin, No. 883 the Snake River Basin, and No. 884 the Pacific slope basins in Oregon and lower Columbia River Basin, for the year ended September 30, 1939.

A study of the physical characteristics of soils, with special reference to earth structures, D. M. BURMISTER (*New York: [Author], 1938, pp. V+63, figs. 23*).—The author brings some of the physical factors into a more unified and consistent pattern by an evaluation of the grading analysis of soils, based on physical as well as simplified statistical considerations. He points out that the grading-density relations of granular materials describe basic physical relations and give quantitative expression to the important influence of the distribution of particle sizes and of particle shape upon density, and that these relations are of fundamental importance, because density is a determining factor in the supporting capacity of the natural soil and in the stability of slopes and earth fills of granular materials.

The plastic characteristics of fine-grained soils are treated in a similar manner to define reliable relationships between the simpler soil tests and those describing the behavior of soils. Certain practical applications in the analysis of soils for earth dams are made, and methods developed for the analysis and presentation of the data are discussed.

Measurement of electrode potentials and polarization in soil-corrosion cells. R. B. DARNIELLE (*Jour. Res. Natl. Bur. Standards [U. S.]*, 25 (1940), No. 4, pp. 421-433, figs. 4).—Electrode potentials in soil-corrosion cells cannot be measured accurately by the direct method because of the high resistance of soils and because of the nature of the electrolyte and the electrodes. Measurements made with a mechanical interrupter are also in error because of depolarization during the period of interruption. By using an electronic circuit to interrupt the current for intervals of the order of 10^{-7} sec. and a separate electronic circuit to measure the electrode potentials within this period of interruption, results accurate to about 0.01 v. over the range of current, resistance, and rate of depolarization of soil-corrosion cells were obtained. These results were obtained with steel electrodes and in seven soil types and an unidentified alkali soil as the corrosion media.

Although the modifications introduced into this method were for the purpose of adapting it to measurements in soils, it appeared that the method as modified would be well adapted to such high-resistance solutions as natural waters, particularly in potential measurements on metals which naturally develop high-resistance films.

Method for determining the moisture condition in hardened concrete. G. R. GAUSE and J. TUCKER, JR. (*Jour. Res. Natl. Bur. Standards [U. S.]*, 25 (1940), No. 4, pp. 403-416, figs. 13).—An electric hygrometer developed at the National Bureau of Standards for a radio-sonde use is described, together with a method for using this hygrometer to measure the relative humidity inside cavities within concrete.

The r. h. in cavities at various locations in the material inside 12-in. concrete cubes stored at 50 percent r. h. or 300 days was found to range from 50 percent near the surface to 66 percent near the center of the cube. For cubes stored at 20 percent r. h. the corresponding range was from 20 to 60 percent. The r. h. inside coated specimens was higher than in the uncoated specimens, but the results indicated that none of the coatings were impermeable to water. The r. h. inside hermetically sealed concrete specimens was found to decrease as the temperature decreased and to return to its original value when the temperature was increased to its original value. The r. h. over neat-cement pastes of approximately normal consistency and cured in hermetically sealed containers was measured. The r. h. decreased to 94 percent at 7 days and to 88 percent at 28 days, over a moderate heat-of-hardening cement, and decreased to 88 percent at 3 days, to 82 percent at 7 days, and to 79 percent at 28 days, over a high-early-strength cement.

The electric hygrometer appears to be well suited to the measurement of r. h. inside concrete and over cement pastes.

Costs of farm power and equipment. J. P. HARBEL and P. WILLIAMSON (*[New York] Cornell Sta. Bul.* 751 (1941), pp. 38, figs. 13).—From the data obtained in a survey of 438 farms in 1936 and from complete cost-account records kept by 75 farmers for 1933 and 1939, it is shown that tractor power was more economical than horsepower for most farm work, and especially for such heavy draft jobs as plowing and fitting. On cost-account farms the cost of operating a tractor was about the same as that of a 2-horse team. The cost per hour for horses and tractors depended largely on the annual use, but averaged for

a 2-horse team and driver 66 ct., as compared with 80 ct. for a tractor and driver. Farmers had about \$1,500 invested per farm in power and equipment. The annual maintenance and operating cost was about \$850. Depreciation and interest made up more than one-half the cost of operating equipment. Such costs as repairs, farm labor, housing, grease, oil, and fire insurance accounted for the remainder. More than one-half the depreciation occurred in the first 5 yr. of use, but most tools were not discarded until they were from 15 to 20 yr. old. The annual cost of equipment decreased as it became older, depreciation and interest dropping faster than the cost for repairs increased.

Almost one-half of the tools had been purchased second-hand. Second-hand equipment required a smaller investment and was cheaper to operate. From the standpoint of operating cost and reliability, the saving made by using second-hand equipment was greatest on farms where the equipment was needed for a relatively small number of acres or hours. Many farmers cooperated in the use of equipment and reduced their cost and investment by share owning, hiring, exchanging, and borrowing different tools. Except for borrowing, these arrangements were usually mutually beneficial, since the fixed costs could then be spread over more acres or hours of use.

With the exception of a few old tools, most equipment that might be badly damaged by exposure to the elements was housed. There was a tendency for tools that were not housed to be shorter lived and to have higher annual repair costs, but it seemed doubtful if a saving could be made by building a shed to house such tools, since the higher repair costs were offset by the saving in building costs. An appendix gives a method of calculating depreciation.

The operation, care, and repair of farm machinery (*Moline, Ill.: John Deere, 9. ed., pp. [3]+225, figs. [220]*).—It is the purpose of this book to assist instructors in farm mechanics in giving a thorough and practical course in the operation, care, and repair of the more important farm machines. It is designed especially for those studying farm mechanics in high schools, colleges, and short courses with the expectation of applying the knowledge gained to actual farming or to teaching. Part 1, on the preparation of the seedbed, contains chapters on plows, including plow bottoms, walking plows, riding plows, tractor plows, disk plows, and wheatland implements; disk harrows; and harrows, pulverizers, and field cultivators. Part 2, planting, deals with grain drills, corn planters, cotton and corn planters, listers, and potato planters. Part 3, cultivating, takes up rotary hoes, shovel cultivators, disk cultivators, and listed crop cultivators. Part 4 includes, under the head of harvesting, grain binders, combine harvesters, corn binders, silage harvesters, corn pickers, potato diggers, mowers, and hay rakes and loaders. Part 5 discusses tractors and gasoline engines as sources of power on the farm. Part 6, headed soil fertility, contains chapters on manure spreaders and lime and fertilizer sowers. An appendix of useful information comprises a chart for calculating the acre-hour capacity of machines of any width of cut at from 1 to 5 miles per hour, and various tabulated data for computing machine requirements, areas, weights, and capacities of several varieties of storage spaces.

This edition is more complete in its coverage of detail than the previous editions.

Oat chop sifter (*[Edmonton], Alta.: Dept. Agr., 1941, p. 1, pl. 1*).—The chop sifter or hull separator here described consists essentially of a sifting drum of wire screening, 3 ft. in length by 16 in. in diameter, mounted on six longitudinal slats 0.5 by 0.75 in. which are attached through wooden hubs to a 1-in. wooden shaft by three sets of 0.75-in. round spokes, together with a tin-plate feeding worm or auger, 4 in. in diameter, placed about the upper end of the shaft (sloped 1.5

in. to 1 ft.) and projecting out of the drum and revolving in a tin-plate cylinder attached to a tin-plate hopper. This device is mounted in a simple wooden frame and is operated by a crank attached to the upper end of the shaft. Working drawings accompany the publication.

It is pointed out that although the hulls and other coarse parts of the chop are suitable for feeding to cattle and horses, pigs up to 3 or 35 mo. of age should have no oat chop which has not been sifted.

Estimating the quantity of settled corn silage in a silo, J. B. SHEPHERD and T. E. WOODWARD (U. S. Dept. Agr. Cir. 603 (1941), pp. 12, figs. 3).—Based on data taken on corn silages ranging from about 25 to 32 percent dry matter, a table is presented for estimating the settled-silage content of silos. Silages containing an average of 27.89 percent dry matter and with an average depth of 34.8 ft. averaged 48.1 lb. per cubic foot. Weights per cubic foot of silage as determined in these studies were consistently higher than those reported by the Missouri Experiment Station (E. S. R., 41, p. 691), which in the authors' opinion are best suited to silage containing from 34 to 36 percent dry matter.

Electric fence controllers, with special reference to equipment developed for measuring their characteristics, F. A. EVEREST (Oreg. Engin. Expt. Sta. Bul. 11 (1939), pp. 47, figs. 29).—Noting the possible hazard involved in the general use of devices which energize great lengths of exposed conductor, the author notes that "before regulatory bodies can function effectively, they must have data on the physiological effects and lethal limits of various types of electric shocks and have available proper instruments for measuring the various electrical quantities involved." This bulletin is largely concerned with the necessary instruments, their design, and methods for their use.

Typical fence circuits are first dealt with, the energizing methods taken up being an inductive discharge, direct current and alternating current operated: continuous and intermittent alternating voltage; charged condenser, continuously or intermittently applied to fence; and the charged condenser relaxation circuit. Theoretical considerations of the induction type of electric-fence controller include a mathematical analysis, transient solutions for current make and for current break, and mathematical expressions for quantity of electricity circulating in secondary circuit at current make and at current break.

A section on photography of random transients by means of the cathode-ray tube describes a trigger circuit. Measurement of the quantity of electricity in electric-fence controller impulses is taken up, a statement of the problem being followed by discussion of an integrator circuit. Voltage dividers for transient phenomena are considered, and a high-voltage, vacuum-tube voltmeter, involving the use of the inverted vacuum tube as a voltmeter, is described.

For testing electric-fence controllers under conditions closely simulating those of actual operation, the author devised an instrument called an artificial fence. It is pointed out that the electrical parameters of a single fence wire strung at a constant height above the ground include a linear resistance, which may be taken as its entire impedance, self-inductance being treated as negligible. Leakage resistance across all insulators and grounded objects touching the wire, all being in parallel, are lumped as an equivalent single resistance. The capacitances between earth and incremental lengths of the wire are similarly summed as an equivalent capacitance. It is considered that the resistance of the wire is normally so low that it, as well as the self-inductance, may be neglected. The artificial fence, therefore, consisted of a series of parallel resistances giving a range of from 100 to 500,000 ohms and parallel condensers giving a range of from 0.003 to 0.079 $\mu\text{f.}$, the entire range of the resistance and capacity of the instrument being equivalent to about 5.6 miles of fence.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Mississippi Station, 1939] (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), Nos. 1, pp. 4-5; 2, p. 1.*)—In addition to findings previously noted, brief statements by C. Dorman are included in No. 1. (1) comparing the average labor income and net profit on farms growing and not growing sweetpotatoes for manufacturing starch, and (2) showing the average investment, indebtedness, net income, labor income, etc., on 80 typical truck farms in Copiah County. In No. 2, additional data as to these truck farms are discussed by M. Guin and D. W. Parvin.

RURAL SOCIOLOGY

Favorable aspects of farm tenancy, C. E. ALFRED and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 122 (1941), pp. [1]+II+32, figs. 8.*)—This discussion is based on findings of the station and other agencies. A bibliography of 171 titles is appended.

Of southern white farmers who began farming as renters, 38 percent have raised their tenure level to farm owners (E. S. R., 80, p. 843). Tennessee farmers who began as tenants and are now landowners by purchase have acquired landownership at as early an age as was the case in former years. Tenant farming is found more profitable than owner farming in returns on investment and savings to the renter on an acre basis. "Percentage of tenancy is generally highest in the most productive areas. Owners on poor land receive less for their efforts than tenants on good land. . . . The general status of tenants is being improved through better lease conditions, legislation, and a better understanding of tenancy problems brought about by studies made by various agencies. Tenant living standards are improving, as evidenced by higher educational levels attained by farm tenants and their children, high value of tenant family living, and good housing conditions, compared with owners, and the fact that tenants are leaders in community activities. . . . Some absentee ownership may be beneficial and desirable because of its stabilizing effects on land values, its training of farm tenants, and legislative support of farm interests. Supervised tenancy is often very successful. Cooperative enterprises participated in by tenants are also quite successful."

Rural community organization in Washington and Frederick Counties, Maryland, L. S. DODSON, D. ENSMINGER, and R. N. WOODWORTH. (Coop. U. S. D. A. et al.). (*Maryland Sta. Bul. 437 (1940). pp. 105-164, figs. 2.*)—This bulletin consists largely of a description of individual communities in Washington County as an aid to planning.

A rather wide variation was found in the proportion of the population of communities in these counties who belong to such social and economic organizations as fraternal orders, citizens' associations, chambers of commerce, cooperatives, and youth organizations, being four times as great in some communities as in others. "Communities which have the largest membership also have the largest percent of attendance. In communities where membership is large, attendance is good, and in communities where membership is small, attendance is poor. . . . The churches, measured in terms of membership and attendance, attract from three to four times as many persons as the social and economic organizations. The numbers of persons from both the village and open country attending the same social and economic organizations and churches indicate that there is little social distance between village and country people. . . . There are proportionately more relief cases in the open country than in the village. . . . Fraternal orders outnumber all other organizations."

FOODS—HUMAN NUTRITION

Report of the Chief of the Food and Drug Administration, 1940, W. G. CAMPBELL (*U. S. Dept. Agr., Food and Drug Admin. Rpt. 1940, pp. 301*).—This annual report, the first to cover work done under the Food, Drug, and Cosmetic Act of June 25, 1938, and the final report of the Administration as a unit of the Department, is presented under the same general topics as the previous report (*E. S. R., 82, p. 696*).

A study of imported canned sausages and other meat food products, A. VALENZUELA (*Philippine Jour. Anim. Indus., 7 (1940), No. 3, pp. 287-302*).—Physical and chemical examination of imported canned sausages and other meat products showed that most of them possessed good flavor, palatability, and general appearance and had high calorific value.

A chemical study of tomato juices made from Colorado tomatoes, C. F. POB (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci., 1 (1940, No. 1, pp. 15-22)*).—Sound ripe tomatoes purchased on the open market in the vicinity of Boulder, Longmont, and Denver during the seasons of 1931, 1932, 1933, and 1936 were used. The juices, designated as home-canned, were prepared by briefly boiling the tomatoes previously washed (excess water removed), quartered, and crushed, and putting them through a rotary sieve. The product, which consisted of pulp and liquid, was passed through a 20-mesh sieve, uniformly mixed, placed in jars, and sterilized. Data on individual samples and the averages are reported by seasons for total solids and insoluble solids (pulp) determined on the whole juice; and for soluble solids, alcohol-soluble solids, ash, alkalinity of ash, soluble and insoluble ash, total, volatile, and fixed acid, reducing sugar, index of refraction, and specific gravity determined on the filtered juice.

Investigations on the storage of nuts, R. C. WRIGHT (*U. S. Dept. Agr., Tech. Bul. 770 (1941), pp. 35, figs. 7*).—According to an abstract by the author, "pecans, Persian (English) walnuts, almonds, filberts, black walnuts, and macadamia nuts were stored at different temperatures both in the shell and shelled out. The kernels were stored with exposure to the air and also packed in vacuum, in carbon dioxide, and in nitrogen. Unshelled pecans stored at 32° F., with a relative humidity of 75 per cent, were good for more than a year after harvest. In 40° storage they kept a somewhat shorter time, at 50° they remained good only about 6 mo., and at 70° they were found to be stale to rancid in 3 mo. Pecan kernels exposed to the air kept satisfactorily at 32° from 6 to 10 mo., and at 50° about 5 mo. When packed in vacuum and stored at 32° and 50° these kernels kept for from 2 to 3 yr., but at 70° for only 6 to 8 mo. The carbon dioxide pack did not usually keep as well as the vacuum pack. At all temperatures the pecan kernels packed in nitrogen did not keep sweet and free from rancidity any longer than those in cloth bags with exposure to the air. Unshelled Persian (English) walnuts kept in good condition at 32° from 10 to 20 mo., and at 50° from 6 to 20 mo. Shelled kernels exposed to the air did not keep as long as unshelled ones. Vacuum-packed nuts kept longer than those packed by any other method. Carbon dioxide or nitrogen packs proved but little better than when exposed to air. Almonds stored in the shell remained in good merchantable condition and with good flavor at 32° for well over a year after harvest, and at 50° for almost as long. Filberts, like almonds, deteriorated rather slowly. Unshelled nuts or those packed in vacuum or carbon dioxide kept for about a year or over when stored at 32°, 50°, or 70°. Black walnut kernels in cloth bags kept for 20 mo. at 32° and at 50° for 8 mo. When packed in vacuum some of these kept at 70° for almost 2 yr."

Cane, sorghum sirup, valuable in diet; sources of iron, copper, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 2, p. 1*).—A summary of studies previously noted in full (E. S. R., 84, p. 427).

Dietary uses of the banana in health and disease, L. J. BOGERT (*New York: United Fruit Co., (1940), rev. and enl., pp. 63, figs. 3*).—This booklet (E. S. R., 75, p. 566) has been amplified in the present revision to cover all important papers on the composition of the banana and on clinical evidence of its dietary use which appeared between 1935 and 1940.

Proximate analysis of "small cabbage" (*Brassica chinensis* L.) and biological value of its proteins, C. Y. CHANG (*Chin. Jour. Physiol., 15 (1940), No. 3, pp. 243-252*).—About 112 kg. of the well-cleaned edible portion were ground and pressed, the residue and the extracted juice then being analyzed separately for total N and various N fractions, for fatty and nonfatty substances and their respective fractions, and for soluble carbohydrates (as glucose), crude fiber, ash, Ca, Mg, K, Na, P, Cl, and S. The scheme of separation described included acetone treatment of the juice and residue, followed by ether extraction of all fractions giving a total "ether extract" that was a viscous liquid of dark green color and constituted 0.192 percent of the fresh vegetable. Methods of analysis are noted briefly, and analytical results are presented. Biological values of the proteins, determined by the Mitchell method, at the level of 10 percent intake were found to be 79 and 64 for the juice and residue, respectively.

Chinese celery cabbage as supplement to a cereal diet.—I, Growth, digestibility, roughage effect, biological value, and calcifying potency, P. C. Hsu and W. H. ADOLPH (*Chin. Jour. Physiol., 15 (1940), No. 3, pp. 275-284*).—A mixed cereal typical of that used in north China and composed of 2 parts of millet, 2 parts of white flour, and 1 part of soybeans was supplemented with fresh or dried Chinese celery cabbage (*Brassica pekinensis*) in amounts which on a dry weight basis constituted from 6 to 33 percent of the weight of the diet. The response of rats to these various diets was observed. Maximum growth of the animals was obtained when the celery cabbage constituted about 15 percent of the mixture, but as much as 33 percent was fed without effect on the intestinal tract, as revealed by gross and histological examination, or on the apparent digestibility of the protein, calculated as $100 [(N \text{ intake}) - (\text{fecal } N)] / (N \text{ intake})$. The biological values of the protein of the several cereal-dried cabbage mixtures, determined by the Mitchell paired feeding method with the protein level at 10 percent, varied but little with different proportions of celery cabbage in the mixture and averaged 69 percent. Addition of celery cabbage to the cereal diet definitely increased the amount of Ca in the intake, and, as evidenced by determinations on the carcasses of the several groups of experimental animals, led to increased Ca retention in the animal body. "The experiments suggest that the proportion of celery cabbage (or other leaf vegetable) in the ordinary north China dietary could be increased with profit."

Chinese celery cabbage.—I, Carbohydrate, P. C. CHANG and W. H. ADOLPH (*Chin. Jour. Physiol., 15 (1940), No. 3, pp. 285-288*).—Analyses of the edible portion of mature celery cabbage (*Brassica pekinensis*) held for 4-5 mo. in winter storage in an underground cellar showed the following composition, expressed as percentage of the air-dried material: Moisture 7.4, protein 23.6, fat 1.5, ash 12.2, total carbohydrate by difference 55.3, reducing sugars (as invert) 3.84, sucrose 1.28, raffinose 0.00, dextrin 6.60, starch 0.66, cellulose 9.43, lignin 6.78, pentosans 6.83, galactan 2.40, and organic acids (as citric) 2.31. The individual carbohydrate constituents accounted for 72 percent of the

total carbohydrate by difference, and not less than one-fourth of this total was made up of compounds regarded as utilizable carbohydrate.

The effect of added egg phospholipids on the nutritive value of certain vegetable oils, E. J. SCHANTZ, R. K. BOUTWELL, C. A. ELVEHJEM, and E. B. HART (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1201-1204, figs. 2).—In further attempts (E. S. R., 84, p. 413) to determine the factor or factors responsible for the superiority of butterfat over certain vegetable oils for growth in weanling rats on a mineralized skim milk ration supplemented with all of the known essential fat soluble vitamins, the possibility that the difference might be due to some phospholipid present in butterfat but not in the vegetable oils was first tested by adding egg lecithin to corn oil and coconut oil to the extent of 0.25 and 0.5 percent of the oil. Average gains of nine male and nine female weanling rats showed slight improvement as a result of the lecithin addition but not to the extent of equaling the growth on butterfat. In another series comparisons were made of butterfat and corn oil alone or supplemented with suitable quantities of sphingomyelin, sphingosine sulfate, ethanolamine, and choline, respectively. No significant differences in weight were observed from those on corn oil alone except in the case of females on choline. These did not do as well as on the butterfat.

The nutritive value of the fatty acid fractions of butter fat, E. J. SCHANTZ, R. K. BOUTWELL, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.) (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1205-1210, fig. 4).—In continuation of the above noted study the fatty acids of butterfat were separated into volatile unsaturated and saturated acid fractions and the triglycerides of these fractions mixed separately with corn oil in approximately the composition found in butter and homogenized into the mineralized skim milk as before. In two series of tests the milk containing the saturated fraction proved slightly superior and the other two fractions inferior to butter. "It is probable that the fatty acids which are responsible for the superiority of butter over vegetable oils are present in larger amounts in butterfat, and in the mixture of corn oil and the saturated fraction from butterfat an increased amount of saturated fatty acids of high molecular weight made possible the accelerated growth."

Meat in the infant's diet, L. K. CAMPBELL (*Natl. Livestock and Meat Bd. Rpt.*, 17 (1940), pp. 40, 48, fig. 1).—A brief preliminary report is given of an investigation in which lean meat, dried and powdered, was added in varying amounts up to 4 teaspoonfuls a day to milk formulas or drinking water of normal, full term, and premature infants as early as 10 days after birth.

The effects of a beef liver fraction upon fat synthesis in rats, E. W. MOHENY and G. GAVIN (*Science*, 91 (1940), No. 2355, p. 171).—It is noted briefly that in an extension to other vitamins of the B complex of earlier work showing the synthesis of fat in rats and pigeons by thiamin (E. S. R., 81, p. 877), a fraction of beef liver containing several B vitamins, including pantothenic acid and factor W, has been found to be capable of increasing the quantity of body fat in rats depleted of fat on a fat-free diet from 3 to 7 percent and the liver fat from 3 to 17 percent. Reduction of excess fat to normal levels could not be secured by the administration of choline, but was effected in a few days by feeding a pancreatic extract "lipocaic" and also, but to a lesser degree, by feeding a concentrate from rice polish or by giving yeast. The liver fraction was prepared by removing the alcohol from the 92 percent alcohol solution from which the antianemic fraction had previously been precipitated. The effect was not a toxic one, as young animals receiving the fraction doubled their weight in a week and were active and healthy. It is suggested that choline may be concerned with the reduction of neutral fat in the liver, while lipocaic may exert its effect upon cholesterol esters.

Factors in the growth of girls, F. A. MULLEN (*Child Developmt.*, 11 (1940), No. 1, pp. 27-42, figs. 5).—This paper presents an analysis by a bifactor technic of intercorrelations of 17 physical measurements of girls of 7, 9, 11, 13, 15, and 17 yr. of age, respectively.

The value of routine blood-protein determinations, H. H. SHUMAN and H. JEGHERS (*New England Jour. Med.*, 222 (1940), No. 9, pp. 335-339).—The blood protein level was determined by the Kagan falling-drop technic* for each of 320 medical patients and 25 healthy normal controls. The method, sufficiently simple for use in routine determinations, was also found to be satisfactory from the standpoint of accuracy. Blood protein values determined by this method in 20 cases were found to vary from 0.00 to no more than 0.49 gm. per 100 cc. from values determined on the same bloods by macro- or micro-Kjeldahl methods. In the normal group of subjects the values fell within normal limits of from 6 to 8 gm. per 100 cc. with two exceptions (5.98 and 5.70 mg. per 100 cc.), but in the medical cases abnormal values were found in about 25 percent of the patients. This 25 percent included 12.1 percent of determinations that were less than 5.5 gm. and 5.3 percent less than 5.0 gm. per 100 cc. Only one case (0.3 percent of total) showed hyperproteinemia with a blood protein value of 8.73 gm. per 100 cc. The significance in clinical diagnosis of variations of blood protein from normal are reviewed and discussed in the light of the results here reported. It is pointed out that most persons with hypoproteinemia will respond favorably to dietary measures alone, except probably in cases of liver disease and poor gastrointestinal absorption and utilization.

Hematological standards for the Chinese, C. H. WU and C. TSAI (*Chin. Jour. Physiol.*, 15 (1940), No. 3, pp. 289-299).—Cell volume, hemoglobin value, red blood cell and white blood cell counts, and erythrocytic fragility were determined in 310 healthy adult Chinese by methods noted briefly. These and several blood coefficients are reported and compared with standards established for westerners. For male subjects red blood cells averaged 5,000,000 per cubic millimeter, cell volume 42 percent, hemoglobin content 98 percent of the Haldane hemoglobinometer scale equivalent to 13.6 gm. per 100 cc. of blood; for female subjects the corresponding averages were 4,200,000, 35.7 percent, and 82 percent (equivalent to 11.3 gm. per 100 cc.), respectively. Mean corpuscular volume averaged $85.4\mu^3$, mean corpuscular hemoglobin 27.4 $\gamma\gamma$, and mean corpuscular hemoglobin concentration 32 percent. The degree of erythrocytic fragility varied appreciably with different individuals. With concentrations of buffered NaCl solution of 0.38, 0.40, 0.41, and 0.42 percent at pH 7.15, the mean percentages of hemolysis were 70-74, 46-55, 37-39, and 24-32, respectively. White blood cell count also showed quite large variations, the average (shown to be valid statistically) being about 6,800 per cubic millimeter for both sexes.

The role of coenzymes I and II in blood of persons with pneumococcal pneumonia, R. W. VILTER, W. B. BEAN, J. M. RUESEGGER, and T. D. SPIES (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 9, pp. 897-899, fig. 1).—Attention is called to recent observations by Kohn (E. S. R., 82, p. 710) and Vilter et al. (E. S. R., 83, p. 420) of a decrease in the concentration of coenzymes I and II in the blood of patients with clinical pellagra and of unpublished observations from the latter group on 150 additional cases. Observations are now reported showing a similar decrease in the concentration of these coenzymes in the blood of 17 of 20 patients with acute lobar pneumonia, and of the increase to normal limits within 24-48 hr. after a crisis induced either by serum or by sulfapyridine. "These findings are consistent with the clinical knowledge that pneumonia predisposes malnourished persons to attacks of pellagra."

* *Jour. Clin. Invest.*, 17 (1938), No. 4, pp. 369-372, figs. 4; pp. 373-376, fig. 1.

The nutritional approach to experimental dermatology, M. SULLIVAN and J. NICHOLLS (*Jour. Invest. Dermatol.*, 3 (1940), No. 4, pp. 309-316; 317-335, figs. 13; 337-345, figs. 5).—The first of these three papers on a variety of skin changes produced in rats by feeding experimental diets is an introduction and review of the literature. The comment is made that most of the recorded observations have been made by investigators other than physicians with the result that there have been misinterpretations and even mistakes, particularly by biochemists whose interest in skin changes was secondary to a desire for securing information concerning a chemical substance through biological procedures. Incorrect or inexact use of descriptive terms of clinical dermatology is noted as leading to confusion. Among such terms are dermatitis, which has been loosely applied to changes of the skin ranging from scaling to gangrene; alopecia, used as a synonym of denuding; crusting for scaling; and at times cyanosis, confused with pigmentation. The other papers deal with nutritional dermatoses in the rat, as follows:

I. *Vitamin B₆ deficiency*.—The diet used in this study consisted of acid-washed casein 18, sucrose 66, McCollum salt mixture (No. 51) 6, cod-liver oil 2, and washed butterfat 8 percent, supplemented with thiamin, riboflavin, and nicotinic acid at levels of 2, 1.5, and 1.5 mg., respectively, per kilogram of diet, and with filtrate factor equivalent to 100 gm. of liver. The crystalline materials were dissolved in alcohol or water, added in solution to the casein, and allowed to evaporate. It is noted that this diet may not contain adequate factor W and may lack other undefined components of the vitamin B complex, but gross and microscopic studies of 10 controls fed the diet supplemented with crystalline B₆ at a level of 2 mg. per kilogram of diet showed no skin changes during the period in which the characteristic changes appeared in the animals receiving the basal diet alone. Gross and microscopic changes are described in detail, with photographs and microphotographs.

The dermatitis which developed on the diet completely devoid of vitamin B₆ was symmetric, the sites involved being limited to the dorsal and plantar surfaces of the paws, the nose, the lips, the chin, the submental region, the upper chest, and occasionally the sides of the face. The normal gross and microscopic appearance of the skin and fur in all other areas is emphasized as being of great value in the differentiation of the vitamin B₆ deficiency disease from skin conditions due to deficiency of other components of the vitamin B complex. An important secondary sign found was abscesses in and adjacent to the areas of specific dermatitis.

The microscopic findings are illustrated by microphotographs of sections of the dorsal and plantar surfaces of the paws, the earliest, most typical, and constantly duplicated sites. The changes are described as consisting of "hyperkeratosis, acanthosis, edema of the corium with hyperemia, and a diffuse infiltrate composed of lymphocytes and larger mononuclear cells in the early stage with the addition of polymorphonuclear leukocytes later." The sebaceous glands and hair follicles were not affected until the later stages, when there was often an infiltration of polymorphonuclear leukocytes into and around the hair follicles and sebaceous glands.

II. *Skin changes in rats deficient in the entire vitamin B complex other than thiamin*.—The same basal diet was used as in the study noted above but with thiamin as the only supplement. In place of a combination of the skin changes characteristic of deficiencies in the individual vitamins of the B group, dermatitis of the paws was observed only irregularly and never of the type characteristic of vitamin B₆ deficiency; spectacle alopecia, characteristic of deficiency of the filtrate factor, was seen in only about half of the group and then usually of mild

degree; and graying of the fur, when it did occur, was of such slight degree as to be discounted. The appearance of the fur resembled that of riboflavin deficiency, although the animals were cleaner than those on a diet deficient in riboflavin.

Biological investigations with radioactive calcium and strontium, C. PECHER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 86-91, figs. 3).—With the idea of possible application of the radioactive strontium isotope to therapeutic bone irradiation, a comparison was made of the metabolism of calcium and strontium, using the isotopes Ca^{45} and Sr^{90} produced by bombardment of the respective elements with 16 million volt deuterons. Because of greater yield, the suitable energy of its β -rays, and its convenient half life (55 days), the radioactive strontium isotope was considered more suitable than that of calcium for biological studies. Moreover, in the production of radioactive strontium there was produced as a secondary product an appreciable amount of a long-lived (about 100 days) radioactive yttrium, the most likely among the artificial radioactive elements now known which may be substituted for radium as a penetrating γ -ray source.

The uptakes of radioactive calcium and strontium administered intravenously and orally were observed with mice. Doses of 0.1 cc. of radioactive calcium lactate solution (0.8 mg. calcium, 200 counts per second) and 0.1 cc. of radioactive strontium lactate solution (1.6 mg. strontium, 0.8 microcurie) injected intravenously were recovered in the skeleton to the extent of 58 percent (average 30 mice) and 33 percent (35 mice) of the respective doses 24 hr. following injection. Although the retained fraction was higher for calcium than for strontium, the distribution of the elements was similar. They were concentrated in the skeleton, the activity of the soft tissues being negligible in comparison with that of the bones. Activity determinations and autoradiographs of the bones, made by placing them on a photographic film, showed that radio strontium was higher in the trabecular than in the cortical bone (rats and rabbits), that activity was higher in the dorsal vertebrae than in other bones, and that the average activity of the teeth was higher than that of the bones, the activity of the base of the incisor teeth (mice and rabbits) being especially high.

Intravenously administered radioactive calcium and strontium were excreted both in the feces and in the urine; in mice the larger fraction was generally in the feces. The day following subcutaneous injection of a large dose of radioactive strontium lactate in rats, most of the activity was found in the urine. A few days later about the same amounts were found in feces and urine. It appeared to make no difference in uptake whether the radioactive strontium was given intravenously or orally or as the chloride, lactate, or gluconate.

Radio-calcium and radio-strontium metabolism in pregnant mice, C. and J. PECHER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 1, pp. 91-94).—Adult virgin and pregnant mice receiving a normal diet containing about 1 percent CaCO_3 were injected with doses of 0.1 cc. of radioactive calcium or strontium lactate in the same concentrations as noted in the above study. At different periods after the injection the mice were sacrificed and radioactivity of bones, soft tissues, and uterus of each mouse was measured. Newborn mice were killed within 12 hr. after birth and the radioactivity of their whole bodies measured.

Data presented to show the uptake in mothers, fetuses, and offspring indicate that most of the radioactive calcium or strontium was fixed in the bones of the mothers a few days after injection, while the activity of the soft tissues and uterus was low. At birth, however, there was an appreciable amount of the radioelement in the young, the specific activity of the whole body of the offspring

frequently being higher than that of the mother's bones. When a few newborn mice containing no radioactivity were given to radioactive mothers, an appreciable amount of activity was noted in the adopted offspring after a few days. Radioactive strontium lactate injected intravenously into lactating mice was recovered in the offspring after 2 days to the extent of 19, 20, and 11.8 percent.

Fasting catabolism and food utilization of calcium-deficient rats, M. KLEIBER, M. D. D. BOELTER, and D. M. GREENBERG. (Univ. Calif.). (*Jour. Nutr.*, 19 (1940), No. 6, pp. 517-530, fig. 1).—Rats fed only 10 mg. of calcium per 100 gm. of food showed retarded growth, due mainly to decrease in appetite, their mean body weight being 30 percent below that of litter-mate controls fed ad libitum on the same diet but brought to a content of 430 mg. of calcium per 100 gm. of food. In another group the calcium-supplied control rats were kept at a weight equal to that of their calcium-deficient pair mates by reducing the food intake through paired feeding to a level slightly below that of the calcium-deficient rats. As compared with the calcium-supplied controls, the calcium-deficient rats were shorter and had a finer skeleton: had a significantly higher dry weight of liver; contained only one-half as much ash and one-third as much calcium in the carcasses: had only one-half the concentration of calcium in the blood serum; and were less active. The rate of fasting catabolism, determined by respiratory trials at intervals over the experimental period on the rats kept at 30° C. for 18 hr before and also during the trials, and expressed per kg.^{3/4} of body weight, was found to be considerably higher for the calcium-deficient rats than for their calcium-supplied controls. The total efficiency of utilization of food energy (defined as total gain of body energy/total energy of food consumed) was decreased by calcium deficiency, not only by a lowered food intake and a higher basal metabolism, but also by a lowered partial efficiency (change in gain of body energy/corresponding change in energy of food consumed).

Relation of the dietary calcium-phosphorus ratio to iron assimilation, H. D. ANDERSON, K. B. McDONOUGH, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 5, pp. 464-471, figs. 3).—Anemic rats were used as the test animals. These were placed on a dry ration in which the Ca:P ratio was varied through additions of CaCO₃ and NaH₂PO₄. This ration when supplemented with Fe and Cu permitted rapid growth and hemoglobin regeneration. Fe utilization, as estimated by consideration of hemoglobin regeneration and the Fe increment stored in the liver, was favored by low Ca:P ratios, maximum utilization occurring at a ratio of 0.45, with decreasing utilization as the Ca:P ratio increased to 7.65. Hemoglobin response on mineralized milk was found to be greater than that on the dry ration with the higher Ca:P ratios, but less than on the ration with the Ca:P ratio of 0.45. Studies on the pH of the intestinal tract showed that the pH of the colon in rats on a diet with Ca:P equaling 0.45 was lower (5.2-6.1) than in those on diets with a high Ca:P ratio in which the pH of the colon was 6.2-7.2. It is considered that Cu was probably not as completely utilized from the dry ration as from milk, since increase in the Cu level (to 50 µg. per gram of ration) greatly stimulated hemoglobin formation. The results obtained under the condition of this study are interpreted to indicate that within limits ordinarily reached in most diets Ca impedes the absorption of Fe, while P has a stimulating effect.

The effect of ferric chloride on the utilization of calcium and phosphorus in the animal body, P. REHM and J. C. WINTERS (*Jour. Nutr.*, 19 (1940), No. 3, pp. 213-222).—Paired groups of rats matched as to initial weight, age, and sex were carried through a 30-day feeding period in which one group received a standard artificial diet, while the other group received this same ration sup-

plemented with enough ferric chloride to combine with one-half of the P of the diet. The food intakes of all animals were kept approximately the same. Weight gains were recorded, and at the end of the period the animals were analyzed individually for total ash, Ca, and P. Comparison of the two groups showed that in spite of the equalized food intake animals on the unsupplemented diet gained more weight than those receiving the supplement of ferric chloride.

Animals on the unsupplemented ration averaged 1.283 and 1.214 gm. for total body Ca, 0.868 and 0.807 gm. for total body P, and 4.774 and 4.448 gm. for total body ash in males and females, respectively, as compared with 0.923 and 0.924 gm. for Ca, 0.648 and 0.646 gm. for P, and 3.555 and 3.555 gm. for ash in the males and females, respectively, in the group receiving the ferric chloride supplement. These results are interpreted as indicating that ferric chloride has a detrimental effect on Ca and P metabolism, probably due to the formation of insoluble ferric phosphate and resulting interference with P assimilation. In a second experiment in which cod-liver oil in the diet was reduced from 2 percent, as originally used, to the 1 percent level, the addition of ferric chloride resulted in less drastic lowering of body Ca and P.

The utilization of iron and the rapidity of hemoglobin formation in anemia due to blood loss, P. F. HAHN, J. F. ROSS, W. F. BALE, and G. H. WHIPPLE (*Jour. Expt. Med.*, 71 (1940), No. 6, pp. 731-736, figs. 2).—In studies employing eight standard anemic dogs, radioactive iron was administered in doses varying from 0.2 to 115 mg. Following the path of the radio-iron as a tracer element, it became evident that the iron, after absorption, was utilized promptly by the body, appearing in traces as hemoglobin in the red cells in circulation within 4 hr. Within 24 hr. the radio-iron was present in red cells in considerable amount and could be shown to be present in the crystallized hemoglobin. The absorbed "labeled" iron was entirely converted into hemoglobin within 4-7 days under the standard anemic conditions employed. In general the absorption was more efficient in small doses in single feeding experiments, and as the iron intake was increased the percentage absorption fell rapidly. When the red cell production had been accelerated by iron feeding or diet factors or when the dose of iron was very small, almost all of the absorbed radio-iron was converted to hemoglobin in 2-3 days.

Bone development in the albino rat on a low manganese diet, L. L. BARNES, G. SPERLING, and L. A. MAYNARD. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 562-565, figs. 2).—Rats normal at 21 days of age and reared on the manganese-low diet of Daniels and Everson (E. S. R., 74, p. 884) showed no abnormalities in growth or bone development. Five of the females, bred with males from the stock diet, bore 57 living and many dead young. Of the 16 young that lived to an age of 100 days or more, 2, both females, had abnormal tibias characterized by shortened length, narrow epiphysis, and at the proximal end a diameter large in proportion to the length. Females from mothers on the low-manganese diet had shorter tibias and weighed less than females from mothers on the stock diet. These differences were not apparent in the males, however. The limited data suggest that the albino rat is less sensitive than the chick to manganese deficiency, and that the growth of females but not of males is impaired by such deficiency.

The fluorine contents of foodstuffs in Szechuan, L. T. CHENG and T. P. CHOU (*Chin. Jour. Physiol.*, 15 (1940), No. 3, pp. 263-267).—Fifty-two Chinese foodstuffs, including 32 kinds of cereals, vegetables, and fruits, 7 kinds of tea, and 14 table salts, were analyzed for their fluorine content by procedures noted briefly. The fluorine content of the foodstuffs varied from a fraction

of a milligram to 75.5 mg. per kilogram of dry material. The teas varied from 6.8 to 91.3 mg. and the salts from 34.8 to 115.1 mg. per kilogram.

Solubility of fluorosed enamel and dentine, J. F. VOLKER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 4, pp. 643-645, fig. 1).—To test the assumption that lowered incidence of dental caries in fluorosed teeth might be due to lessened acid solubility of the fluorine-containing dentin and enamel, solubility studies were conducted on these two structures as obtained from normal and fluorosed rat and human teeth. Mildly and severely fluorosed rat incisors were obtained from animals on diets containing 20 and 300 p. p. m. of fluorine, respectively, and the mildly mottled human material was from individuals in areas where dental fluorosis is endemic. After separation and purification of the dentin and enamel, solubilities were determined by measuring the weight losses of duplicate 50-mg. samples after definite time intervals in 20-cc. amounts of 0.2 M acetic acid/sodium acetate buffer.

In all cases the dentin showed greater solubility than the corresponding enamel. In the experimental series the severely fluorosed rat dentin and enamel (containing, respectively, 0.25 and 0.125 percent F) showed lower solubilities than the corresponding normal tissues (containing, respectively, 0.01 and 0.008 percent F). The mildly fluorosed dentin and enamel were similar to the normal tissues in solubility. In the human series also the mildly fluorosed enamel was similar to the normal in solubility, although the slightly fluorosed dentin (containing 0.07 percent F) was somewhat less soluble than the normal dentin (0.017 percent F). These results, indicating that large amounts of fluorine decrease the solubility of the dental hard tissues while small amounts do not, suggest that the small amount of fluorine in slightly fluorosed teeth is not sufficient to alter their acid solubility.

Fluorine, mottled enamel, and dental caries, H. T. DEAN (*Jour. Ped.*, 16 (1940), No. 6, pp. 782-794, figs. 4).—A review concerned chiefly with epidemiological studies. Thirty-nine references are given.

Dietary protein and the toxicity of sodium selenite in the white rat, H. B. LEWIS, J. SCHULZ, and R. A. GOERNER, JR. (*Jour. Pharmacol. and Expt. Ther.*, 68 (1940), No. 2, pp. 292-299, figs. 3).—The present studies, designed to determine the effect of variations of dietary protein and of supplementary cystine and methionine on the toxic action of inorganic selenium (25-50 p. p. m. as sodium selenite), showed that diets containing 30 percent of casein afforded more protection to young white rats than diets of equal caloric value containing 6 percent casein. Methionine (0.45-0.89 percent) added to the latter diet also afforded protection, whereas cystine (in amounts equivalent to the methionine) did not. The supplementary methionine also afforded protection when added to a selenium-containing diet having the protein supplied by arachin at a 15 percent level. "These experiments suggest that the character of the dietary protein supplements may materially modify the toxicity of inorganic selenium compounds."

Taste thresholds and taste preferences of rats for five common sugars, C. P. RICHTER and K. H. CAMPBELL (*Jour. Nutr.*, 20 (1940), No. 1, pp. 31-46, figs. 5).—Experiments were conducted, by means of the free-choice technic used in previous studies (*E. S. R.*, 84, p. 697), to determine the threshold concentration at which rats first distinguished between sugar solution and water, and also the concentration at which maximum preference for the sugar solution was shown, as judged by the amount of solution drunk. Glucose solutions in the various trials were varied from 0.01 to 80 percent concentration in 44 steps, maltose from 0.01 to 50 percent in 24 steps, sucrose from 0.20 to 80 percent

in 28 steps, galactose from 0.01 to 25 percent in 35 steps, and lactose from 0.01 to 17 percent in 35 steps. The solutions were varied in concentration by small steps until the animals definitely distinguished between sugar solution and water, whereupon the strength was increased by much larger steps. Curves presented to show the average daily intake of distilled water and each of the several sugar solutions indicate that the rats distinguished between sugar solution and distilled water in the following concentrations: Maltose 0.06 percent, glucose 0.20, sucrose 0.57, and galactose 1.60 percent. The relative heights of the curves indicate further that the animals showed the greatest preference for maltose, next for glucose, and then for sucrose, with only slight appetite for galactose and none for lactose. The greatest preference for the sugar solutions was shown at a concentration averaging 11 percent for the various animals in the case of glucose, the average daily intake at the peak concentration averaging 90 cc.; for maltose, sucrose, and galactose the peak concentrations averaged 10, 8, and 9 percent, respectively, with consumption averages of 75, 65, and 28 cc., respectively; for lactose the highest daily average at any time was 15 cc. It is pointed out that these concentrations, averaging near 10 percent, agree closely with concentrations of sugar solutions most commonly used by humans in sweetened drinks. On the basis of results of previous self-selection reports, it is concluded that maltose, when offered in purified form to adult animals, may be utilized better than other sugars, whereas lactose is utilized least well.

The vitamin A content of palm-kernel oils, H. A. FEHLMANN and C. F. POE (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci.*, 1 (1940), No. 1, pp. 29-35, fig. 1).—Sixteen samples of crude palm-kernel oil obtained from importers and 5 samples of the refined oil were assayed for vitamin A content by the method of Sherman and Burtis (*E. S. R.*, 60, p. 194). Over an 8-week period the weight gains of animals fed from 1.5 to 3.0 gm. of oil daily indicated that 5 of the crude samples averaged 0.15 Sherman units per gram; 11 contained so little vitamin that the Sherman units could not be counted. The samples of refined palm-kernel oil gave little indication of any vitamin A content.

The effect of muscular work on the flavin content of liver [trans. title], H. MINIBECK and F. VERZÁB (*Ztschr. Vitaminforsch.*, 10 (1940), No. 1-2, pp. 79-88, fig. 1; *Fr. Eng. abs.*, pp. 87, 88).—Adult rats held on a diet free of lactoflavin but otherwise complete lost the flavin of the liver very slowly. Death occurred in 10-19 weeks as the flavin content decreased to 1.20% on down to a low of 400% percent. Rats exercised in a wheel for 5 hr. daily suffered a more rapid decrease in liver flavin content, the level falling to about 500% percent within 3 weeks, at which time the rats began to die. All animals in this group were dead within 7 weeks, with a minimum liver flavin content of about 400% percent. "The fact that the yellow respiration ferment is connected with carbohydrate metabolism explains why more of it is needed during muscular work."

Riboflavin determinations on normal liver and liver tumor, H. KAHLER and E. F. DAVIS (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 604-606).—Riboflavin was determined by a fluorometric method in rat liver and muscle tissue. Normal livers and cirrhotic livers developed without gross tumor formation from long feeding of the dye, 2-amino-5-azo-toluene, gave riboflavin values averaging 30.1% per gram of fresh tissue for rats from 256 to 550 days of age. Livers in which tumors had developed due to the dye feeding contained from 8% to 26.8% of riboflavin per gram of fresh tumor tissue and from 15% to 29.8% per gram in the residual liver tissue. On the basis of lyophilized dry weight, the concentration of riboflavin in normal liver tissue was 106.7% per

gram, as compared with only 59.2 γ per gram in tumor tissue. Muscle values of from 2.1 γ to 3.3 γ per gram of fresh tissue indicated that the animals were not suffering from general riboflavin deficiency.

Endemic riboflavin deficiency in infants and children, T. D. SPIES, W. B. BEAN, R. W. VILTER, and N. E. HUFF (*Amer. Jour. Med. Sci.*, 200 (1930), No. 5, pp. 697-701, pl. 1).—In repeated examinations during a period of 2 yr. of 472 children from 5 mo. to 4 yr. of age of parents with deficiency diseases, cheilosis was observed in 113 cases, linear lesions on the lips in 93, and ocular manifestations in 167. The appearance of the symptoms varied with the season, occurring most frequently during the spring and summer and not always in the same order. Increased exercise and infections precipitated the appearance of lesions in the borderline cases. All of the symptoms responded promptly to riboflavin therapy or improvement in the diet, but recurred again in the same order with suspension of therapy.

The excretion of riboflavin varied with the adequacy of the diet, although there was some lag in changing from high to low diets or vice versa. In the absence of therapy all of the patients with advanced lesions excreted less riboflavin than normal persons of the same age, sex, and size. Practically all of the mothers of the children had subsisted on grossly inadequate diets (consisting chiefly of biscuits, corn bread, gravy, and sirup) during pregnancy and lactation. In every instance infants began eating the family diet as early as 2 or 3 mo. of age, although in some cases breast feeding was continued until the children were 2 or 3 yr. of age. It was estimated that the majority of infants and children observed received only about 35 percent of their estimated requirement of riboflavin.

The average case responded favorably to the oral administration of 1 mg. of riboflavin three times a day or 1 oz. of brewers' yeast or liver extract once a day even while continuing on the inadequate diet. However, the addition of liver, lean meat, and milk is recommended wherever possible.

Dysphagia ascribed to vitamin B deficiency, I. R. JANKELSON (*Amer. Jour. Digest. Diseases*, 7 (1940), No. 6, pp. 252, 253).—Histories are given of six cases of dysphagia attributable to vitamin B (complex) deficiency and relieved by adequate vitamin B therapy. Two cases of dysphagia due to other causes did not respond favorably to vitamin B administration.

The effect of imbalance in the "filtrate fraction" of the vitamin B complex in dogs, A. F. MORGAN. (Univ. Calif.). (*Science*, 93 (1941), No. 2411, pp. 261-262).—In this preliminary report the results are summarized of a series of observations over periods of from 6 to 19 mo. on young purebred cocker spaniels to determine the effect of various combinations of filtrate factor, nicotinic acid, and pantothenic acid as supplements to a purified diet of washed casein, sucrose, crisco, salt mix, carotene and cod-liver oil, wheat germ oil and crystalline thiamin chloride, vitamin B₁₂, and riboflavin. The three positive controls on the basal diet with all three supplements were reported to be well, although not quite as heavy as stock dogs of the same age. Two of three receiving none of the three supplements were alive and well, although showing inactivity, impaired digestion, and sedate elderly behavior with progressively graying fur. One of this group died of an infection after 6 mo. on the diet. Of four receiving an ample amount of nicotinic acid but no pantothenic acid or filtrate factor, three died of progressive flaccid paralysis and the other was cured when near death by administration of the filtrate fraction. Of four given ample amounts of the filtrate factor and/or pantothenic acid but no nicotinic acid, two had slowly progressing paralysis (one dying within 3 and the other within 6 mo.). A third developed symptoms later and a fourth

showed no symptoms after 18 mo. One male and one female were given pantothenic and nicotinic acids but no filtrate factor. At the end of 6 mo. the male was well and growing, although beginning to show some failure of neuromuscular control. The female had lost appetite and weight and showed more advanced failure of neuromuscular control. Commenting on these findings, the author states "attention should be given to the possible danger of the administration of large amounts of certain vitamins such as nicotinic acid to persons subsisting on diets having multiple deficiencies. Fortification of foods with those vitamins such as thiamin or nicotinic acid which are available in large quantities may precipitate conditions worse than the subacute deficiency state produced by the usual diet balanced in its inadequacies. Improvement in all directions equally is essential."

The influence of alcohol on the adequacy of the B vitamins in the American diet, N. JOLLIFFE (*Quart. Jour. Studies Alcohol*, 1 (1940), No. 1, pp. 74-84, fig. 1).—The role of alcohol in contributing to nutritional diseases is described as "(1) the irritant action on the gastric mucosae, causing gastrointestinal disturbances and the resulting dietary restrictions; (2) the chemical, physiological, and structural changes produced in the gastrointestinal tract, leading to interference with absorption or utilization of vitamins; (3) the substitution of vitamin-free alcohol for vitamin-containing food; (4) the increased vitamin requirement in consequence of the calories furnished by alcohol." In the elaboration of (4) vitamin B₁ is used as representative of the various fractions of the B complex. With reference to the Cowgill formula

$$\frac{\text{vitamin B}_1 \text{ milligrams equivalent}}{\text{calories}} = 0.0284 \text{ weight in kilograms,}$$

diets with vitamin B₁:calorie ratios of 1.7 to 2.29 are considered borderline, and with ratios below and above these figures as inadequate and adequate, respectively. It is shown that the addition of vitamin B₁ calories in the form of alcohol may change a vitamin B₁:calorie ratio from within the normal to a borderline range irregularly associated with beriberi. Similarly, a low calorie intake might make a diet containing only small amounts of vitamin B₁ adequate to prevent the development of vitamin B₁ deficiency disease. It is emphasized that in evaluating the adequacy of vitamin B₁ in a diet, calories derived from alcohol if taken in significant amounts should always be considered.

"Our dietary, without alcohol calories, already provides such a small margin of safety in the B vitamins that when any of the numerous factors that increase the vitamin requirement of the individual occur clinical avitaminosis is likely to develop."

Curative effect of pantothenic acid on adrenal necrosis, R. C. MILLS, J. H. SHAW, C. A. ELVEHJEM, and P. H. PHILLIPS. (*Wis. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 482-484).—Data are summarized confirming the earlier noted conclusions of Daft et al. (*El. S. R.*, 85, p. 276) that pantothenic acid is capable of preventing and curing the adrenal necrosis observed in rats on a purified vitamin B complex-free ration supplemented with thiamin, vitamin B₂, riboflavin, nicotinic acid, and choline.

On the difference between thiamin deficiency in the rat and deficiencies of the other members of the vitamin B complex, M. K. DIMICK (*Jour. Nutr.*, 19 (1940), No. 6, pp. 605-610, fig. 1).—Individual weight curves are presented for four groups of seven rats each on the same basal vitamin B complex-deficient diet supplemented through the depletion period by all but one of the vitamins thiamin, riboflavin, vitamin B₂, and factor 2 (rat filtrate factor), and in cases of survival further supplemented by the missing factor. The curves for all but

thiamin deficiency are characterized by a plateau period, with rapid response in growth following supplementation of the diet by the missing factor. In the case of thiamin the drop in weight occurs very quickly. This difference is thought to have a clinical bearing in emphasizing the acute nature of thiamin deficiency as compared with the chronic nature of the deficiencies of the other B vitamins. Clinically, nutritional deficiencies are generally multiple in nature, but marked responses are frequently obtained with the administration of thiamin only. With continued administration of the thiamin with no other dietary change, one of the more chronic deficiencies may develop.

Non-identity of gray hair produced by mineral deficiency and vitamin deficiency. A. H. KREE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 371-373).—According to this preliminary report, "all of the present evidence based on experiments with approximately 50 rats seems to indicate that graying of black hair in rats may result from a deficiency of a factor or factors present in the vitamin B complex and may also result from a deficiency of iron, copper, and manganese."

Vitamin B₂ determinations. I. MAGYAR (*Ztschr. Vitaminforsch.*, 10 (1940), No. 1-2, pp. 32-40; *Ger., Fr. abs.*, pp. 39, 40).—Urinary excretion of vitamin B₂ determined by a thiochrome procedure, was followed over a 10-day period in a normal individual receiving daily intravenous injections of 10 mg. of vitamin B₂. The excretion was irregular, increasing from 2,818 γ on the first day to 4,620 γ on the fourth day, and then decreasing gradually to 1,212 γ on the tenth day. Excretion in the 24 hr. following a single intravenous injection of 10 mg. of the vitamin varied from 1 to 17 percent of the amount injected in 9 patients who, because of nutritional deficiencies, fever, and disturbances of assimilation, were suspected of B₂ hypovitaminosis; in 29 cases not in the above category the excretion varied from 18 to 56 percent (average 25 percent) of the injected dose. Six of the patients in the former group were given daily intravenous injections of 10 mg. of the vitamin over periods of from 3 to 12 days. In these cases the excretion, followed daily, was found to increase and then (in the longer periods) to decrease irregularly.

From these results it is suggested that excretion of less than 18 percent of a single injected 10-mg. dose of the vitamin in the 24 hr. following the injection is indicative of vitamin B₂ deficiency; likewise, increasing excretion upon repetition of injections at daily intervals suggests deficiency.

In 40 cases examined the vitamin B₂ content of the serum, determined by the Ritsert method (*E. S. R.*, 82, p. 298), varied from 1 to 15 percent (average 7.6 percent). Vitamin B₂ could not be found in gastric juice or in cerebrospinal fluid.

Cheilosis successfully treated with synthetic vitamin B₂. S. G. SMITH and D. W. MARTIN (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 4, pp. 660-663, fig. 1).—Four cases of cheilosis are reported, of which the first three (a 7-year-old colored girl, a 62-year-old white woman, and an 18-month-old white girl) were cured by vitamin B₂ treatment, while complete healing of the fourth (a 27-year-old sprue patient) did not occur following treatment with vitamin B₂ (1,000 mg.) or a combination of B₂ (300 mg.), riboflavin (140 mg.), and nicotinic acid (1,000 mg.). The lesions finally healed following the intramuscular injection of 445 units of a concentrated liver extract for 1 week. Attention is called to the fact that the first case was cured while the patient was still receiving a diet deficient in riboflavin, and in the third case the lesion developed while the patient was receiving a presumably adequate supply of riboflavin from approximately 1 qt. of milk a day and a fair amount of vitamin B₂ from bananas.

Three possible explanations are suggested for the curative action for cheilosis of both riboflavin and of vitamin B₆—“(1) that riboflavin is the primary and specific deficiency responsible for the cheilosis and the B₆ operates only indirectly, (2) that vitamin B₆ is the primary and specific deficiency responsible for the cheilosis and the riboflavin acts only indirectly, and (3) that both riboflavin and vitamin B₆ are necessary to maintain the integrity of the lips at the mucocutaneous junction and that a deficiency of either will precipitate the lesion.”

Vincent's disease treated with nicotinic acid, J. D. KING (*Lancet* [London], 1940, II, No. 2, pp. 32-35, figs. 3).—Four case records are given illustrating the successful treatment of severe Vincent's disease (trench mouth) by nicotinic acid. A footnote states that since the paper was written 30 other cases have been treated with equally encouraging results. Attempts to produce the syndrome in a healthy man by inoculation with infected material from a severe case of Vincent's disease were unsuccessful. Preliminary studies of the excretion of nicotinic acid in the urine of 4 people with normal gums and 1 with Vincent's disease showed much lower values for the latter.

The possible association between pellagra and Vincent's disease is discussed, with the suggestion that the latter as well as the former may be related to a deficient intake or utilization of nicotinic acid and its allied pyridine derivatives, although it is considered still advisable to treat the lesions as infectious. The earlier view that the disease is due to a deficiency of vitamin C is not supported by sufficient evidence.

The vitamin C content of vegetables and fruit [trans. title], C. SCHÄTZLEIN and E. FOX-TIMMLING (*Ztschr. Untersuch. Lebensmit.*, 79 (1940), No. 1-2, pp. 157-164).—Data for moisture and ascorbic acid, the latter determined by an indophenol titration method, are reported for numerous samples of lettuce, asparagus, kohlrabi, tomatoes, cucumbers, cabbage, cauliflower, rhubarb, strawberries, currants, gooseberries, raspberries, sweet and sour cherries, Mirabelle and prune plums, peaches, apricots, and grapes. With certain exceptions noted, these products were grown in one region on a given soil and with uniform fertilizer treatment and cultural conditions for any given kind of fruit or vegetable. Differences in vitamin C content due to variety and to season of harvest were studied. In some cases also a study was made of differences due to sampling (inner and outer leaves of lettuce, thick and thin stalks of asparagus, peeled and unpeeled cucumbers) and to refrigerator storage.

The vitamin C content of the flower nectar of certain Labiatae [trans. title], C. GRIEBEL and G. HESS (*Ztschr. Untersuch. Lebensmit.*, 79 (1940), No. 1-2, pp. 168-171, fig. 1).—The method described for obtaining the nectar involved rapid centrifugation of the blossoms. The blossom residue and the restraining plug of nickel gauze were removed from the centrifuge tube, permitting the nectar collected in the tip of the tared tube to be weighed and titrated directly without transfer, using an indophenol titration procedure. The nectars of wild creeping thyme (*Thymus serpyllum*), field mint (*Mentha arvensis* and *M. aquatica* × *arvensis*) and water horehound (*Lycopus europaeus*) were found to contain, respectively, 222, 268, and 222 mg. percent of ascorbic acid.

Rôle of vitamin C in Addison's disease, J. F. JENOVESE, A. E. OSTERBERG, and E. H. RYNEARSON (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 337-339).—Six patients with Addison's disease were tested for the ascorbic acid content of the blood plasma in the fasting state and of the urine in a 24-hr. sample and a 3-hr. sample following a test dose of 500 mg. Similar tests were made on six normal controls.

The controls gave blood plasma values ranging from 0.57 to 1.48 mg. per 100 cc., 24-hr. urine values of from 18.5 to 58.2 mg., and 3-hr. urine values following the test dose ranging from 3.6 to 57.1 mg., two of the subjects showing unusually low values following the test dose. Corresponding figures for the patients with Addison's disease were blood plasma from 0.94 to 1.57 mg. per 100 cc., 24-hr. urine from 5.01 to 20.1 mg., and the 3-hr. urine following the test dose from 1.34 to 103.5 mg. The highest values for all three determinations among the patients were obtained with one whose history of Addison's disease was of short duration and who was in the custom of taking a pint or more of tomato juice daily. Excluding this case, the highest values for the group of patients were 1.22 mg. per 100 cc., 13.1 mg., and 33.7 mg., respectively. A comparison of these figures with the controls suggests normal blood plasma and low excretion values as characteristic of patients with Addison's disease. In saturation tests conducted on one of the patients 5 days after the subject had presumably been saturated, as judged by the excretion of over 65 percent of the test dose, a 24-hr. urine specimen contained only 16 mg. of ascorbic acid, while the blood plasma value, 2.01 mg. per 100 cc., was considerably above the threshold value. On the basis of these results it is concluded that the urinary excretion of ascorbic acid alone cannot be used as an index of vitamin C deficiency in Addison's disease.

Urinary excretion of combined ascorbic acid in pulmonary tuberculosis, S. BANERJEE, P. B. SEN, and B. C. GUHA (*Nature [London]*, 145 (1940), No. 3679, pp. 706, 707).—The relative excretion of free ascorbic acid, dehydroascorbic acid, and combined ascorbic acid, as differentiated in an earlier note of Guha and Sen-Gupta (*E. S. R.*, 80, p. 713), by 9 normal individuals and 10 patients suffering from acute pulmonary tuberculosis is reported in terms of mean values of ascorbic acid in the infected condition owing to increased metabolism, this evidence (tuberculous) 5.82 and (normal) 44.62; dehydroascorbic acid 3.52 and 7.41; combined ascorbic acid 8.11 and 15.93; total ascorbic acid 17.45 and 67.96, and combined ascorbic acid, as percentage of the total, 42.24 and 23.52, respectively. These values are thought to point to a large reduction in the urinary output of total ascorbic acid in tuberculosis and a tendency to a relatively greater excretion of combined ascorbic acid. "Apart from the simple destruction of ascorbic acid in the infected condition owing to increased metabolism, this evidence appears to support the view that ascorbic acid probably functions as a detoxicating agent, combines with certain toxins or toxic metabolites produced in the infected condition, and tries to eliminate them."

Influence of arsenicals, bismuth, and iron on the plasma ascorbic acid level, C. J. FARMER, A. F. ABT, and H. C. S. ARON (*Soc. Ezpt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 495-499, figs. 3).—A study of the influence of the heavy metals bismuth, iron (as ferrous sulfate), and arsenic (as neovarsphenamine) on plasma ascorbic acid is summarized, with the conclusion that there are three types of action. Bismuth is without influence, iron causes a marked decrease in plasma ascorbic acid but at the same time a rise in hemoglobin, and arsenic a decrease in ascorbic acid which is thought to represent a detoxifying action. It is suggested that repeated plasma analyses should be made to determine the amount of ascorbic acid required for maintenance of optimum plasma levels during treatment with drugs which react with ascorbic acid.

The occurrence of vitamin D in fresh leafy vegetables, C. Y. CHANG and H. WU (*Chin. Jour. Physiol.*, 15 (1940), No. 3, pp. 253-262).—The antirachitic effect of several fresh vegetables, namely, "small cabbage" (*Brassica chinensis* L.), colza (*B. parachinensis* Bailey), kni-ts'ai (*Brassica* sp.), and kan-lan-ts'ai (*B. oleracea* L. var.), was determined with rats and chicks, using bone ash

content as an index of vitamin D. In 35-day feeding tests with chicks, the fresh vegetable supplement was not effective in increasing the ash content of the tibias of the test birds over that of the controls on the basal diet, thus indicating that the fresh vegetable contained no vitamin D effective for chicks. In rats, however, those receiving the supplement over a 70-day period showed a higher average bone ash than did the negative controls. To determine whether this effect was due to vitamin D or to Ca and P contained in the vegetable, an assay was carried out with rats on the fatty substances extracted from the fresh small cabbage by the procedure of Chang noted on page 412. Control groups of the rats were given the basal diet plus inorganic Ca and P (in amounts equivalent to those furnished by the supplement of small cabbage) or cod-liver oil or both. While the mineral content of the vegetable corrected to some extent the high Ca:low P imbalance of the basal ration, the bone ash values of the rats on the rachitogenic diet supplied with the extracted fatty substances pointed to an antirachitic effect of this extract. The results of this assay compared with the data of Hume et al. (E. S. R., 68, p. 152) indicated that the amount of vitamin D in the fresh small cabbage was about 0.2 International Units per 100 gm.

Microscopic lesions without functional impairment of striated musculature of suckling E-low rats, I. R. TELFORD, G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 1, pp. 135-136).—In an attempt to determine the minimal prophylactic dose of α -tocopherol to insure normal cross-striated musculature in suckling rats, α -tocopherol dissolved in ethyl laurate was administered by stomach tube at 6- and 10-mg. levels to a series of female rats on the first day of lactation, and the young were observed daily for evidence of muscle impairment. All of the young (64) from mothers receiving the solvent alone showed paralysis or impaired muscular function, while none of the 30 young whose mothers had received 6 mg. and of the 41 whose mothers had received 10 mg. showed similar signs. However, histological examination of 16 muscles from several animals of each of the three groups revealed microscopic lesions of dystrophy in 12 of the muscles in the group receiving 6 mg. of α -tocopherol. In the 10-mg. group microscopic lesions were entirely absent.

Growth-stimulating activity of alpha tocopherol, M. M. NELSON, G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (Soc. Expt. Biol. and Med. Proc., 45 (1940), No. 1, pp. 157-158, fig. 1).—In an extension of earlier work (E. S. R., 80, p. 280) the daily administration of α -tocopherol at 0.25- and 0.50-mg. levels to female rats in which growth had plateaued on a vitamin E-low diet stimulated growth to the same extent as that previously secured on 1 mg. daily.

Treatment of muscular dystrophies and allied conditions: Preliminary report on use of vitamin E (wheat germ oil), S. STONE (Jour. Amer. Med. Assoc., 114 (1940), No. 22, pp. 2187-2191).—In case reports of five patients with muscular dystrophy and two with muscular atrophy following anterior poliomyelitis in the one case and an attack of multiple neuritis in the other, "definite improvement was obtained in all cases with muscular dystrophy, the improvement being manifested in gain in muscle strength, the disappearance of fatigue and muscle pain on slight exertion, change in muscle texture, and displacement of dystrophic musculature by normally contracting muscle tissue. In the cases of muscular atrophy following involvement of the nervous system, increase in amount of regeneration of muscle tissue became apparent after the addition of vitamin E (wheat-germ oil) to the vitamin B complex the patients were receiving. The addition of vitamin B complex to vitamin E appeared to increase the therapeutic efficaciousness of the latter."

Vitamin G content of Colorado head lettuce, C. F. POE and L. HAERTMAN (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci.*, 1 (1940), No. 1, pp. 43-47, fig. 1).—Determinations of vitamin G by the method of Bourquin and Sherman (E. S. R., 66, p. 410) in five samples of Colorado-grown head lettuce indicated that the outer dark green leaves contained from 55 to 62 Sherman units per 100 gm. of vitamin G, this amount being virtually the same as the 54 to 67 units in the inner lighter leaves.

Water-soluble antihemorrhagic compounds, S. ANSBACHER, E. FERNHOLZ, and M. A. DOLLIVER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 4, pp. 652-655).—The results of vitamin K assays by the method of Ansbacher (E. S. R., 83, p. 12) are reported for a number of compounds. 2-Methyl-1,4-naphthoquinone (or methylnaphthoquinone), the most active vitamin K compound known, showed an activity of 1 unit per $\frac{1}{4}\gamma$ when administered orally in water or the slightly lower activity of 1 unit per $\frac{1}{2}\gamma$ when administered orally in oil or intravenously in water. The phosphate derivative (sodium 2-methyl-1,4-naphthohydroquinone diphosphate) was considerably less active (1 unit per 10γ administered orally) and the sulfate still less potent (1 unit per 25γ given orally) and less readily absorbed. 2-Methyl-1,4-naphthylene-dioxy diacetic acid, synthesized by the method described and involving the reaction of 2-methyl-1,4-naphthohydroquinone and monochloroacetic acid in the presence of NaOH, was found to have a potency of 1 unit per $2,000\gamma$ when administered orally in water solution. This activity was comparable to that previously determined for a specially purified product of phthiocol given orally in capsules. Minimum effective doses in 6- and 18-hr. tests are recorded for these several compounds.

Potencies of vitamin K₁ and 2-methyl-1,4-naphthoquinone, S. A. THAYER, R. W. MCKEE, S. B. BINKLEY, and E. A. DOISY (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940) No. 2, pp. 585-588).—The potencies of 2-methyl-1,4-naphthoquinone and a preparation of vitamin K₁ obtained by recrystallization at -70° C. of the product prepared by hydrolysis of pure diacetyl dihydrovitamin K₁, were compared by bio-assay. A 6-hr. observation period was employed, and the response of the chicks was evaluated by (1) the percentage of chicks showing a clotting time less than 10 min., (2) the mean clotting time, and (3) the mean prothrombin time. The tabulated results show that in the four experiments in which $0.5 \mu\text{g.}$ of 2-methyl-1,4-naphthoquinone was given the percentages of the groups showing clotting times less than 10 min. were 50, 67, 50, and 90, while with $1.0 \mu\text{g.}$ the response was always 100 percent. With the vitamin K₁, the response to quantities from 1 to $2 \mu\text{g.}$ ranged from 80 to 100 percent. The highest ratio of the potencies of the two compounds was about 3:1, the lowest less than 2:1. The relation of these findings to those previously reported by Thayer et al. (E. S. R., 82, p. 89) and those by Ansbacher et al. noted above is discussed.

Absorption of water-soluble vitamin K from intestinal tract, E. W. WARNER and J. E. FLYNN (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 607, 608).—To determine whether bile salts are essential for the absorption of water-soluble forms of vitamin K, bile duct ligation was performed in rats depleted preoperatively of vitamin K reserves, and the animals were placed on a diet rigidly restricted in vitamin K. When the prothrombin level fell into the bleeding zone, as it did in from 3 to 4 days, the potassium salt of the disulfuric acid ester of 2-methyl-1,4-naphthohydroquinone was administered in daily doses of 2, 5, and $8 \mu\text{g.}$ given by stomach tube, both with and without bile salts (1 cc. of 3 percent sodium taurocholate). The extent to which the vitamin was utilized was judged by the subsequent rise in prothrombin. Results presented to show the response of rats to the water-soluble form of

vitamin K indicate that the bile salt did not appreciably affect the therapeutic efficacy of the vitamin. With 2- μ g. doses the prothrombin remained in the bleeding zone, but with 5- μ g. doses the levels rose to 35-70 percent of normal and with 8- μ g. doses to more than 75 percent of normal, these responses being observed both with and without the bile salts.

Effect of vitamin K on hypoprothrombinemia of experimental liver injury. K. M. BRINKHOUS and E. D. WARNER (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 609, 610, fig. 1).—Liver injury was produced in dogs by repeated small doses of chloroform. In each experimental pair the two dogs were of the same weight and received the same diet and the same chloroform dosage. One animal in each pair received in addition a daily vitamin K supplement consisting of the petroleum ether extract of 200 gm. of alfalfa meal emulsified in 30 cc. of 2 percent solution of bile salt. The results of plasma prothrombin determinations conducted throughout the experimental period are presented graphically for each dog in a typical experiment. The chart shows that the administration of vitamin K failed to modify in any way either the fall in prothrombin during the 18 days of chloroform administration or the rise in prothrombin during the 7-day recovery periods. "It is suggested that when vitamin K deficiency and liver injury are both present, as in many patients, administration of the vitamin may correct the former, but one cannot expect that an excess of the vitamin will compensate for the element of liver injury."

The clinical application of the hippuric acid and the prothrombin tests. A. J. QUICK (*Amer. Jour. Clin. Pathol.*, 10 (1940), No. 3, pp. 222-233, figs. 3).—The value of the hippuric acid test for liver function is discussed, and the technic is described.

Since vitamin K is essential for the synthesis of prothrombin, a decreased concentration of the latter in blood may occur (1) if the intake of vitamin K is insufficient, (2) if the absorption of the fat-soluble vitamin is deficient due to lack or insufficiency of bile in the intestines, or (3) if liver function is so impaired as to prevent the conversion of vitamin K into the prothrombin component. Under the first condition, it is pointed out, vitamin K therapy would be effective as has been shown in cases of hemorrhagic disease of the newborn; under the second condition administration of vitamin K with bile salts should effect an elevation of the prothrombin level and has been demonstrated as effective in cases of biliary obstruction or fistula; in the third case improvement in liver function is necessary for vitamin K therapy to effect an increase in blood prothrombin.

The prothrombin test described consists essentially in adding to oxalated blood plasma an excess of thromboplastin and then recalcifying with a fixed quantity of calcium chloride. Since thromboplastin, calcium, and fibrinogen, also involved in the reactions, are constant, the rate of fibrin formation (coagulation time) is a direct measure of the concentration of prothrombin. In the test 4.5 cc. of venous blood are drawn and mixed at once with 0.5 cc. of 0.1 M sodium oxalate; plasma is obtained by centrifugation, and to 0.1 cc. of the plasma are added 0.1 cc. of thromboplastin and 0.1 cc. of 0.025 M calcium chloride. The time from addition of calcium chloride to the formation of the clot is recorded with a stop watch, and the prothrombin concentration is read off from a standard curve previously established with various known concentrations of prothrombin. For preparation of the thromboplastin solution, 0.3 gm. of a dried preparation of acetone-extracted rabbit brain is warmed with 5 cc. of physiological saline for 10-15 min. at 50° C., the gross particles then being removed by sedimentation or slow centrifugation.

TEXTILES AND CLOTHING

Moisture relations of textile fibers at elevated temperatures, J. G. WIEGNER (*Jour. Res. Natl. Bur. Standards [U. S.]*, 24 (1940), No. 6, pp. 645-664, figs. 21).—The author's abstract is as follows:

"The moisture contents of 10 kinds of textile fibers in the form of specially prepared yarns were determined when the fibers were in equilibrium with air for a series of relative humidities and temperatures. Data were obtained for both 'desorption' and 'adsorption,' the yarns being brought to equilibrium from a wet condition and a dry condition, respectively. The fibers studied were raw cotton, 'purified' cotton, mercerized cotton, clothing wool, carpet wool, viscose rayon, cuprammonium rayon, raw silk, degummed silk, and cellulose acetate. The temperatures ranged from 96° to 302° F., and the relative humidities ranged from 5 to 90 percent for temperatures below 212° and up to the maximum obtainable at atmospheric pressure above 212°.

"The results are given in the form of graphs showing moisture content against relative humidity and also in the form of graphs in which the logarithms of the moisture contents at given relative humidities are plotted against the reciprocals of the corresponding absolute temperatures. The last show straight-line relationships with changes in the slopes of the lines between 200° and 220°."

The density and swelling of silk filaments in relation to moisture content, A. C. GOODINGS and L. H. TURL (*Jour. Textile Inst.*, 31 (1940), No. 6, pp. T69-T80, figs. 6).—Density and longitudinal swelling, measured by procedures noted, were determined for degummed, white Japanese silk at moisture contents ranging from dryness to saturation. The lateral swelling of the silk filaments was computed from the measured longitudinal swelling and the volume swelling derived from the density data. The regain of the degummed silk, determined by a method described in detail, was measured at 25° C. under both adsorption and desorption conditions for relative humidities ranging from dryness to saturation. A value of 35.8 percent regain for saturated silk was deduced from the density and swelling data.

Variations of shape and area of cross-section in single silk filaments and their effect upon extensibility, A. C. GOODINGS and L. H. TURL (*Jour. Textile Inst.*, 31 (1940), No. 9, pp. T207-T218, figs. 6).—A sample of high-quality Japanese white silk was used in this study. Silk filaments, after special preparation, were embedded in paraffin and cut in serial cross sections of 20 μ thickness. These sections were fixed to microscope slides, dewaxed, and mounted in Canada balsam in series of 20 groups per slide. "By means of the camera lucida, the contours of the filament sections were drawn upon squared paper and their areas determined graphically." These drawings, some of which are presented, showed that the silk filament varied rapidly along its length both as to shape and area of cross section. A basically triangular configuration prevailed, but with considerable modifications. Although variations in shape were large, measurements under the microscope showed that the variations in actual cross-sectional area rarely exceeded 20 percent of the mean.

Load-extension curves determined experimentally for the silk filaments were subjected to mathematical treatment to determine the effect of variations in cross-sectional area on the extensibility of these filaments. It was shown that this effect was small and that experimental curves, reduced to a stress basis, approximated closely to curves for ideally uniform filaments.

Methods for the determination of the mean area of cross section of filaments were studied with reference to their application to relatively short segments of silk filaments. The method of weighing was considered to be the simplest

and most reliable. Details are given of a microbalance suitable for this purpose.

An instrument for the study of compressional creep and creep recovery of yarns and fabrics, K. R. FOX and E. R. SCHWARZ (*Textile Res.*, 11 (1941), No. 5, pp. 227-237, figs. 7).—According to the authors, "a brief outline of previous developments in compression testing of textiles is given, and the details of construction of an instrument intended for the study of compressional creep and creep recovery of yarns and fabrics are noted. Preliminary results are presented to show the characteristics of the instrument. Later papers will discuss specific tests."

HOME MANAGEMENT AND EQUIPMENT

Questions and answers on the cotton-mattress program (*U. S. Dept. Agr., Misc. Pub.* 427 (1941), pp. 4).—This deals with the cotton-mattress program inaugurated in February 1940 by the Department, and designed to supply cotton materials for the making of mattresses by rural families whose economic condition prevents them from purchasing needed mattresses.

MISCELLANEOUS

Mississippi Farm Research, [December 1940-February 1941] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 12, pp. 8, figs. 15; 4 (1941), Nos. 1, pp. 8, fig. 1; 2, pp. 8).—In addition to articles noted elsewhere in this issue these numbers contain the following:

Vol. 3, No. 12.—Leafy Vegetables Best Sources of Iron and Calcium, by O. Sheets (pp. 1, 7), and Methods of Field Curing Hay, by T. N. Jones, O. A. Leonard, and I. E. Hamblin (pp. 3-6), a condensation of Bulletin 353.

Vol. 4, No. 1.—Beekeeping has Possibilities in Favored Areas of Mississippi, by C. Lyle (pp. 1, 8), and Industries Dependent on Training of Rural Girls, and Protecting Farm Crops From Insect Damage, both by C. Dorman (p. 5).

Vol. 4, No. 2.—25,000 Farmers of State Now Receive the Results of Station Research Work (pp. 1, 7); Spraying for Control of Tomato Early Blight, and mosaic resistance of beans, both by C. Dorman (p. 6); and Acid Delinting of Cotton Seed of Little Value Under Mississippi Conditions—Use of Chemical Dusts Recommended, by L. E. Miles (p. 8).

Publications available for free distribution (*Idaho Sta. Cir.* 82 (1941), pp. [4]).—A list of the station and extension publications available as of March 1941.

The Rothamsted memoirs on agricultural science (*Rothamsted Mem. Agr. Sci.*, 23 (1939-40), pp. [977], pls. 16, figs. 113).—This volume consists mainly of the usual separates of 61 papers by members of the Rothamsted staff and discussion taken from various journals and for the most part noted from the original, under the headings of general, crops, plant growth, plant products, action of manures, statistical methods and results, meteorology, the soil—physical properties, soil organisms, insect pests and their control, fungus pests and their control, virus diseases, and miscellaneous.

NOTES

California University.—A 6-year professional course in veterinary medicine has been established. The first 3 years will follow closely the present curriculum in animal science in the College of Agriculture. The third year must be spent at Davis, while for those preceding work at Berkeley, Los Angeles, or elsewhere may be substituted. The final 3 years will be given at Berkeley, the B. S. degree being granted at the end of the fourth year, with 2 more years of graduate work required for the doctorate in veterinary medicine. The number of students admitted to the professional veterinary courses will be limited, with preference to residents of California who have attained high scholastic standing and show special aptitude for veterinary medicine.

Indiana Station.—E. E. Schnetzler, assistant in poultry husbandry, has been granted a year's leave of absence, effective August 20, to pursue graduate work in poultry genetics in the Iowa State College. Dr. R. E. Nichols, instructor in surgery in the College of Veterinary Medicine in the Ohio State University, has been appointed associate in veterinary science, effective July 1, and will have charge of investigations in physiology. Z. H. Beers has succeeded Jack Schluagl as bulletin editor, effective July 15.

Kentucky University and Station.—Herman Lee Donovan, president of the Eastern Kentucky State Teachers College, has been appointed president. Other appointments include Dr. G. Donald Sherman as assistant chemist, Hugh G. Myers as instructor and assistant in soils, and T. C. Hardesty, E. J. Beers, and T. L. Campbell as field agents in cream grading. Noel L. Watson, field agent in cream grading, has resigned. Dr. W. P. Garrigus has been given charge of the animal industry group vice E. S. Good, who, together with S. D. Averitt and James H. Martin, assistant chemists, has been retired and given special assignment.

The name of the College of Agriculture has been changed to College of Agriculture and Home Economics.

Maryland University and Station.—Dr. W. T. L. Taliaferro, associated with the institution from 1892 till his retirement in 1933, died June 4 in his eighty-fifth year. A native of Virginia and a graduate of William and Mary College in 1876, his early life was spent in teaching and newspaper work. In 1892 he became professor of agriculture, in 1914 professor of agronomy and acting dean of the division of agriculture, and in 1917 professor of farm management. He was a pioneer in farmers' institute work, and agronomist of the station from 1899 to 1903.

Dr. T. C. Byerly, professor of poultry husbandry and poultry husbandman, has been appointed senior poultry husbandman in charge of the poultry section of the U. S. D. A. Bureau of Animal Industry.

Nebraska University and Station.—Dr. Edgar A. Burnett, associated with the institution since 1899 and chancellor from 1928 until his retirement in 1933, died June 28. He was born in Hartland, Mich., on October 17, 1865, graduated from the Michigan College in 1887, and served there as instructor and assistant professor of agriculture from 1889 to 1893. In 1896 he became professor of animal husbandry in the South Dakota College and Station and 3 years

later came to Nebraska in a similar capacity. In 1901 he was designated as associate dean in charge of agricultural instruction, and in 1909 dean of the College of Agriculture. He also served notably as director of the station from 1901 to 1928. He was president of the Association of Land-Grant Colleges and Universities in 1925-26 and of the National Association of State Universities in 1936-37. The Michigan College awarded him the D. Sc. degree in 1917, and Nebraska Wesleyan University the LL. D. degree in 1933.

Dr. Frank A. Hayes, professor of soil science since 1936 and in charge of soil surveys in the central northern Great Plains division of the U. S. D. A. Soil Survey since 1917, died May 13 at the age of 50 years. A native of Nebraska he received from the university the B. S. degree in 1913, the A. M. degree in 1915, and the Ph. D. degree in 1936. His special field was soil genesis, morphology, and classification.

Myron H. Swenk, associated with the entomological work of the institution since his graduation in 1907 and chairman of the department of entomology since 1919, died July 17 in his fifty-eighth year. He was also assistant State entomologist from 1907 to 1919 and State entomologist until 1928. In addition to his work in economic entomology he had written extensively on the birds and mammals of Nebraska.

R. R. Thalman resigned effective June 1 to engage in ranch management. He will be succeeded by M. L. Baker, assistant animal husbandman at the North Platte Substation, and he in turn by Cletus F. Reinmiller of the U. S. D. A. Regional Swine Laboratory.

North Carolina College and Station.—A 5-day conference on analysis and interpretation of biological and nutritional data opened at the college on July 7, with a concluding session at Duke University. The conference was arranged to enable research workers in biological subjects and statisticians to consider the application of statistical technics to the planning and interpretation of biological experiments, and was widely attended.

Director R. M. Salter has accepted a position with the U. S. D. A. Bureau of Plant Industry, effective in October, and will be succeeded by Dr. L. D. Bayer, head of the department of agronomy.

Puerto Rico Federal Station.—Dr. Arthur G. Kevorkian, assistant plant pathologist and physiologist, who has been engaged in problems associated with vanilla and cinchona culture, has been loaned to the Government of Ecuador for 1 year for assistance in problems connected with the development of crops noncompetitive with those of this country.

American Dairy Science Association.—The thirty-sixth annual meeting of this association was held in Burlington, Vt., from June 23 to 26, with a registration of 844. The program included an inspection tour of the university farm, including the new dairy barn, which has been so constructed as to compare many kinds of roofings, sidings, and floorings, various insulating materials in the side walls and ceilings, and a number of makes of stanchions and chain ties.

The Borden awards for outstanding research in dairy production and dairy manufacturing, each of \$1,000 in cash and a gold medal, were awarded to E. B. Hart of Wisconsin and Dr. Paul F. Sharp of Cornell University, respectively. H. F. Judkins was elected president for the ensuing year. It is expected that the next annual meeting will be held at East Lansing, Mich., from June 22 to 25, 1942.

EXPERIMENT STATION RECORD

VOL. 85

OCTOBER 1941

No. 4

INDUSTRIAL RESEARCH IN THE UNITED STATES

By R. Y. WINTERS

Assistant Director of Research, Office of Experiment Stations

A second volume has become available in the series sponsored by the National Resources Planning Board under the title *Research—a National Resource*. The first number in this series, it will be recalled, was issued in 1939, dealt with *Federal Relationships to Research*, and has been discussed in these columns (E. S. R., 80, p. 577). It has now been supplemented by the volume transmitted to Congress by President Franklin D. Roosevelt on May 29, 1941, entitled *Industrial Research*. Like its predecessor, this contains much of interest to agricultural research and to research workers in general.

The report is a document of 370 quarto pages and 104 illustrations. It was prepared under the supervision of a committee of 26 members, headed by President F. W. Willard of the Nassau Smelting and Refining Company, with the assistance of a special staff under the direction of Vice President Raymond Stevens of Arthur D. Little, Incorporated. Most of its personnel were actively associated with industrial corporations, but other agencies were represented, among them the land-grant colleges, from whose ranks were drawn the late Dr. C. L. Alsberg, director of the Giannini Foundation of Agricultural Economics of the University of California; Dr. C. H. Bailey, professor of agricultural chemistry in the University of Minnesota and recently named acting director of the Minnesota Agricultural Experiment Station; and Dean F. C. Whitmore of the School of Chemistry and Physics of the Pennsylvania State College.

The report is divided into sections which include discussions of industrial research as a national resource, research in the national economy, examples of research in industry, location and extent of industrial research activity in the United States, research abroad, and men in research. An appendix records the relationship of the National Research Council to industrial research.

Though the primary purpose of the report is to present industrial research as a national resource, its contents are of special interest as a study of background and current relationships between academic and industrial research. In discussing this background of relationships under the section on The Development of Industrial Research in the United States, Mr. H. R. Bartlett reports that "laymen in this country convinced of the importance of the newly discovered facts made it financially possible to establish schools of science and technology, whose avowed object was to instruct students in the application of science to the everyday purposes of life." The report is a witness to the mutually helpful influence of academic and industrial research; in fact, the relationship is described as interdependent.

The study recognizes the importance of scientific findings in Government laboratories as a factor in industrial development. It recommends that "Government bureaus receiving appropriations for scientific work be less restricted than at present in allowances for representation at technical meetings, for publication of findings, and in general, for cooperation with industrial technical workers."

Consideration is given to the importance of adequate technical abstracts of new findings in pure and applied science to research workers in industry, and attention is called to the present struggle of scientific societies to support such service. It is reported that "such support is becoming increasingly burdensome and increasingly inadequate in the face of the enormous and rapidly expanding amount of technical matter being published." It is suggested that "an excellent means of Government contribution to industry would be proper provision for systematic and complete publication of abstracts of scientific and technical literature."

Studies of the organization of research in industry indicate that "committee management is found to be more frequent for research than in other organizational units in industry. Such committees represent other major divisions and define broad research objectives, establish policies, and exercise financial control. The research director supervises the research within the limits thus imposed. In the absence of such practice, equivalent provision for cooperation with other departments usually is provided."

The existence of a research unit in the industrial organization is given credit for contributing direct and indirect benefits to management, "since it increases flexibility in the face of changing conditions and leads to the adoption of research methods in management practice." In the opinion of the authors, research coupled with good management has helped to avoid industrial obsolescence and unemployment. Industries having well-organized research units have been most successful in the maintenance of sales volume and employment.

A section is given to the consideration of research in small industries. Such considerations are particularly pertinent to the thought of decentralizing industries. The report is of interest in its account of research in small industries and other sources of technical information available to them. In Section II. Research in the National Economy, 2. Research—A Resource to Small Companies, Mr. F. E. Raymond reports that "research, which for the small company is 'organized fact-finding', is carried on by the company itself in varying degrees of complexity of organization and is besides the product of collaboration with research agencies, technical institutions, suppliers, equipment manufacturers, customers, and even competitors. In the small company it is usually very individualistic, relying on the inspiration of one or a few executives. There is no apparent relation between the size of the company and the amount of research carried on as evidenced by the number of research workers, kind of research organization, or number of fields of research. The determining factor seems rather to be the kind of process or product."

It was found that considerable technical service is rendered small industries by other industries. For example, "an electrical company carries on research in electronic circuits, doing pioneer work in the field, and its findings are available to customers, small and large. Paint, lacquer, and resin manufacturers had aided small companies in the improvement of their products by special finishes, frequently involving special original research. The small shoe manufacturer obtains his research from suppliers of machinery or materials, some of whom have large laboratories. The flow of technical knowledge from the research laboratory of the large company to the small company and through its sales engineers to the ultimate user or consumer takes the place of highly organized research in many small companies."

In some of the smaller industries much of the time of the technical staff is spent in making contacts with research laboratories of the universities, in reading pertinent technical publications, and in applying the technical information gained from these and other associations to the immediate problems of the industry. Small industries without such technical personnel have difficulty in interpreting and applying available technical knowledge and services to their particular enterprise.

One section is given to the discussion of Men in Research, a consideration of the sciences that have been applied to industrial research. Special consideration is given to the contributions of chemistry, physics, biology, industrial mathematics, metallurgy, electricity, and engineering. Attention is called to the expanding uses of the sciences in industry, and special reference is made to the opportunities for biologists in the food industries and the need for industrial mathe-

maticians in many phases of industrial research. The authors suggest that biologists might find it profitable to initiate a movement comparable to the American Institute of Physics, which, among other functions, did much to present the possibilities of applied physics to industry. Reference is made to the study of Dr. E. B. Fred and Dr. C. N. Frey and their conclusion that "opportunity exists for tremendous increases in the number of biologists, in the food industries particularly."

A discussion of Research as a Growth Factor in Industry brings together some interesting records on the relative participation of groups of industries in research. The comparisons are based upon estimated research expenditures per \$100 value added by manufacture in 1937. Among the groups of industries listed, the expenditures on this basis range from \$2.90 for those engaged in the manufacture of agricultural implements (including tractors) to 5 ct. spent by those concerned with transportation equipment other than motor vehicles. Included among the manufacturers that are spending more than \$2.00 for each \$100 of value added by processing are those concerned with agricultural implements, rubber products, and chemicals. Those spending more than \$1.00 include electrical machinery, petroleum and its products, and motor vehicles. The low figure of 19 ct. estimated for expenditure on problems relating to food and kindred products would indicate a relative need for greater consideration. Groups of industries ranging in expenditures between 5 and 7 ct. per \$100 value added by manufacture consist of those engaged in forest products, textiles and their products, and leather and its manufactures.

The value of research and related technical services to industry may be measured in part by the rapid expansion in their use and the magnitude of expenditures for the maintenance of technical laboratories. It is reported that the number of industrial research laboratories in the United States increased from about 300 in 1920 to more than 2,200 in 1940. Approximately \$300,000,000 is spent annually for their support, and around 70,000 workers are employed in their service. This is an impressive showing.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1939*, pp. 23-32, figs. 2).—These included work on legume silage, sorgo sirup, and processing of cottonseed and cottonseed products by G. A. Shuey; and analyses of soybeans, Korean lespedeza, and tobacco as to plant components by E. K. Weathers.

Relationships between the adsorption isotherm and the spreading force, W. B. INNES and H. H. ROWLEY (*Jour. Phys. Chem.*, 45 (1941), No. 1, pp. 158-165, figs. 6).—A thermodynamic relationship between spreading force and the data of the adsorption isotherm was derived by considering two reversible processes whereby the surface film could be formed. The application of this relationship was compared with the calculation of spreading force from adsorption data. A two-dimensional equation of state corresponding to the Langmuir adsorption isotherm, similar to that which would be expected for a real two-dimensional gas, was derived. A perfect two-dimensional gas was found to correspond to a linear adsorption isotherm.

Base exchange of the clay mineral montmorillonite for organic cations and its dependence upon adsorption due to van der Waals forces, S. B. HENDRICKS. (U. S. D. A.). (*Jour. Phys. Chem.*, 45 (1941), No. 1, pp. 65-81, figs. 8).—Organic salts of the clay mineral montmorillonite were prepared and values of their interplanar cleavage spacings, $d(001)$, were measured at various organic cation contents. The results indicated that the organic cation is held to the surface of the silicate layers of the mineral both by the Coulomb forces between the ions and by van der Waals attraction of the molecules to the surface. Values of $d(001)$ were shown to depend upon the structure of the organic cation and the manner in which it is adsorbed upon the silicate surface. The structures of several molecules were studied by a method based upon this dependence. It was shown that fluorene and the purine bases adenine and guanine are plane molecules. A structure also was found for the nucleosides guanosine and adenosine, in which the plane of the ribofuranose ring is approximately parallel to that of the purine base.

Criticism of a recent paper on the pectic content of plant materials, Z. I. KESTERZ. (N. Y. State Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 565-566).—Referring to the pectin data published by Elwell and Dehn (*E. S. R.*, 82, p. 580), the author points out (1) that the material precipitated from water and dilute sulfuric acid extracts contains much material other than pectin, and (2) that when pectin is determined as calcium pectate, this pectin figure will be of necessity lower than the crude alcohol precipitate figure if accurately determined, whereas the article cited in nine cases states percentages of pectin as calcium pectate even higher than the percentages of crude alcohol precipitate. Attention is directed especially to the figure 90.9 percent for the pectin content of the solids of rhubarb, of which, with other very high figures, the author notes that "no discussion of these percentages is needed to demonstrate the obvious impossibility of these results."

Observations on the hypochlorite oxidation of decomposed plant residues, A. G. NORMAN. (Iowa State Col.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), p. 229).—The author presents a brief general description of the behavior of soil organic matter with respect to oxidizing agents, and concludes in part that oxidation by hypochlorite may apparently be employed in following the progress of aerobic decomposition or in comparing residues obtained from the same parent material and is particularly applicable to such residues as the successive layers of raw humus on the forest floor. This reaction would not seem to be very suitable for the comparison of residues from entirely different sources, mainly because of the differences in reactivity of the lignin which they contain. As the reaction is incomplete, comparisons should always be made at equal dilutions and with excess of hypochlorite, approximately the same initial ratio of chlorine to oxidizable material being maintained. "No attempt should be made to interpret the results as indicating the amount of 'humified organic matter' present or the 'degree of humification', but the increase in reactivity may be taken as a measure of the accumulation of those components."

Studies on some factors affecting the quantitative estimation of the exchange capacity of organic matter, W. M. BROADFOOT and E. H. TYNER. (W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), p. 156).—The authors report experiments showing that the exchange capacity of the organic matter varies with the cation used, that recoveries of barium in the presence of considerable quantities of calcium are too high except when a double precipitation of the barium is carried out, that plant materials contain water-soluble material pertaining to their exchange capacity, that the exchange capacity found is lower when the bases have originally been replaced by the ammonium ion than they were when a divalent cation is used, and that undecomposed organic matter of various types increases in absorptive capacities for ammonium but not for barium on repeated alternate saturation with the two bases. The authors found reason to believe that plant ash absorption of barium is not a normal zeolitic exchange reaction but a calcium carbonate surface reaction, the barium carbonate formed being dissolved rather than replaced on treatment with solutions of ammonium salts.

The oxidation of soil organic matter with hypoiodite, A. G. NORMAN and W. J. PEEVY. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 183-188, fig. 1).—The authors found a certain fraction of the soil organic matter to be readily oxidized by hypoiodite. The reaction, though incomplete, quickly comes to a sharp end point because of the transformation hypoiodite \rightarrow iodate + iodide which goes on concurrently. An index of the reactivity of the organic matter to hypoiodite is provided by the expression
$$\frac{\text{milligram equivalent I}_2 \text{ utilized per 100 gm}}{\text{percent organic carbon}}$$

Within a group of Iowa soils wide differences in reactivity were observed, the results varying from 3.6 to 11.9 m. e. I₂ utilized per unit of carbon. The average figure for the Prairie soils examined was 6.7 m. e. With this reagent differences in the nature of the organic matter in the various layers of a profile can be detected. The organic matter in two Prairie profiles was throughout less oxidizable than that in two timbered soils. In one of the latter, a well-differentiated Podzol, great differences were found between the contiguous layers. The most mobile part of the organic matter was also the part most extensively oxidized by hypoiodite. To a lesser degree similar features were exhibited by a Gray-Brown Podzolic soil.

Hypoiodite was employed on the premise that primarily lignin or lignin-derived material would be involved in the reaction. The figures obtained, however, "probably cannot be regarded as a direct measure of this fraction

because the reactivity of the carbon in the Prairie soils is less than might be anticipated. Preliminary fractionation studies showed that the susceptibility of the oxidizable fraction is reduced by some form of linkage or combination, since acid treatments enhanced the reactivity of the residual carbon."

Plasma proteins: Their source, production, and utilization, S. C. MADDEN and G. H. WHIPPLE (*Physiol. Rev.*, 20 (1940), No. 2, pp. 197-217, fig. 1).—The studies discussed in this critical review are considered under the following headings: Site of formation of plasma protein, materials concerned in the formation of plasma proteins, endogenous materials concerned in the formation of plasma proteins, mechanism of plasma protein formation, and the distribution of body protein—a dynamic equilibrium. A bibliography of 92 references is given.

Isolation of the alkaloids, berberine and berbamine, from Mahonia swaseyi, G. A. GREATHOUSE and N. E. RIGLER (U. S. D. A. and Tex. Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 563-564).—In the separation of berberine from extracts of the species named, the authors found berbamine to remain in the solution. By adding sodium hydroxide and extracting with ether, they obtained berbamine to the extent of from 0.02 to 0.05 percent of the dry weight of the root tissue extracted.

The effects of certain salts on the dissociation of aspartic acid, arginine, and ornithine, A. C. BATCHELDER and C. L. A. SCHMIDT (Univ. Calif.). (*Jour. Phys. Chem.*, 44 (1940), No. 7, pp. 893-909, figs. 10).—By the use of cells without liquid-junction potentials, the effects of certain salt mixtures on the dissociation of aspartic acid, arginine, and ornithine in acid and alkaline solutions were determined. A comparison between the curves obtained by plotting the data and those obtained from theoretical considerations was made together with a comparison of the effects of salts on the ionization of amino acids and proteins. Certain factors not accounted for by the theoretical equations are discussed.

The capillary hematocrit method of determining blood cell volume, C. J. HAMRE (Hawaii Expt. Sta.). (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 5, pp. 547-551).—This work was concerned with perfecting a method for cell volume determinations that would require but small quantities of capillary blood, that would give accurate and easily reproducible results, and that would be practical from the point of view of ease of manipulation and of application to survey studies.

The exploratory work as to types of pipette and methods of use with and without anticoagulants is presented in some detail. The findings indicated that the capillary pipette method of determining cell volume of capillary blood drawn directly into the pipette without an anticoagulant is a satisfactory procedure if centrifuging is carried out immediately. Wetting the pipette with $\frac{1}{2}$ saturated sodium citrate or 1 percent heparin solution and blowing out the excess fluid aided in securing consistently accurate results. For delayed centrifuging it was found that mixing of small approximate quantities of capillary blood with dried heparin in depression slides before filling the pipette permitted complete and accurate packing of the blood cells. The heparin was introduced into the depression of the slide as a 3.0 mm.² drop of 1 percent solution, this amount when dried leaving a visible deposit. The use of dried inorganic anticoagulants in place of heparin led to erroneous results.

An improved method for the iodimetric determination of pyruvic acid, G. A. SCHRAEDER (Ala. Polytech. Inst.). (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 5, pp. 520-526).—An improved iodimetric procedure for determination of pyruvic acid in solutions of the pure compound or in biologic materials is

described in detail as to reagents, procedure, and calculation. Tests of the method indicate that with the apparatus used and the concentrations of reagent employed, 0.10–5.0 mg. of pyruvic acid can be quite accurately determined. The essential improvements consist in (1) the addition of an excess of 0.01 *N* iodine prior to liberation of pyruvate-bound bisulfite with bicarbonate; (2) a decrease in the amount of bisulfite with a consequent decrease in amount of 0.1 *N* iodine and in total volume of solution; and (3) the use of 0.01 *N* sodium thiosulfate which permits a more accurate adjustment of the end point prior to and following the liberation of pyruvate-bound bisulfite.

A general method for the preparation of 2-methyl-3-alkyl-naphthoquinone [trans. title], P. KARRER and A. EPPRECHT (*Helvetica Chim. Acta*, 23 (1940), No. 2, pp. 272–283).—Argument and evidence are presented in substantiation of the structural formulas considered correct for vitamins K_1 and K_2 . 2-Methyl-3-dihydrophytyl-1,4-naphthoquinone was synthesized by a procedure noted in detail. The product obtained had the same absorption spectrum as phyloquinone (vitamin K_1).

Isolation of a crystalline derivative of pantothenic acid, D. W. WOOLLEY (*Science*, 91 (1940), No. 2358, pp. 245–246).—Attention is called to the fact that pantothenic acid is composed of a hydroxy acid united in amide linkage with the amino group of β -alanine (E. S. R., 81, p. 695), and that while β -alanine has been isolated from concentrates of the vitamin, neither the intact pantothenic acid nor the acid fragment has been obtained in pure crystalline form. The latter has now been accomplished by preparing concentrates of the lactone of the hydroxy acid fragment, as previously described (E. S. R., 82, p. 88; 83, p. 567), preparing and acetylating the sodium salt, and converting the acetyl acid to its acid chloride with SOCl_2 and pouring this into concentrated ammonia. The alcohol-soluble fraction of this reaction product slowly crystallizes from a small volume of acetone and alcohol as long needles. On hydrolysis of the crystals with NaOH and recombining the hydroxy acid with β -alanine, a product was formed which was highly active in promoting growth of *Lactobacillus casei*, as well as of rats on a synthetic ration devoid of pantothenic acid.

The biological activity of synthetic pantothenic acid, H. H. WEINSTOCK, JR., A. ARNOLD, E. L. MAY, and D. PRICE (*Science*, 91 (1940), No. 2365, p. 411).—Good agreement is reported between the expected values for the biological activity of pantothenic acid as supplied by rice bran filtrate (Vitab Type II), demonstrated by Jukes (E. S. R., 82, p. 93) to be a rich source of pantothenic acid, and a crude synthetic product. The results agree substantially with those of Woolley noted above.

The structure of pantothenic acid, R. J. WILLIAMS and R. T. MAJOR (*Science*, 91 (1940), No. 2358, p. 246).—This is a brief announcement that the physiologically active pantothenic acid has been obtained by condensation of the crystalline lactone α -hydroxy- β,β -dimethyl- γ -butyrolactone with β -alanine.

The carotenoids of the yellow peach [trans. title], H. THALER and K. E. SCHULTE (*Biochem. Ztschr.*, 306 (1940), No. 1, pp. 1–5).—The dried, powdered flesh of yellow peaches was extracted with a mixture of petroleum ether and methanol (2 : 1 by volume) for 4 weeks in an atmosphere of nitrogen. The extract was diluted with water (50 percent of the volume of the methanol), and the resulting petroleum ether layer was saponified with sodium ethylate, washed, and dried and subjected to chromatographic analysis, using aluminum oxide and developing the chromatogram with a 5 : 1 benzine : benzol mixture. The materials eluted from the individual zones were compared in a Duboscq colorimeter with a solution of azobenzol in alcohol. This analysis showed the presence of carotene, lycopene, and lutein in the relative proportions of 2 : 1 : 8.

The determination of carotene in dried spinach [trans. title], J. GLAVIND and E. HEEGAARD (*Ztschr. Untersuch. Lebensmit.*, 30 (1940), No. 3, pp. 254-256).—The method described for the determination of carotene in plants represents a simplification of the procedure originally described by Willstätter and Stoll (E. S. R., 30, p. 811). The carotene is extracted from the plant tissue with cold acetone, and the residue remaining after evaporation of the solvent is taken up in ether and saponified with methyl alcoholic KOH. The addition of water at this stage permits the separation of an ether layer containing carotene and xanthophyll. After drying with anhydrous sodium sulfate, the ether is evaporated and the residue is taken up in petroleum ether, from which solution the xanthophyll is removed by selective extraction with methyl alcohol. The carotene remaining in the petroleum ether layer is determined with the aid of the Pulfrich photometer, using the filter S 45 and the extinction coefficient $E_{1\%}^{1\text{cm}} = 2,350$ in the calculation for carotene. Both α - and β -carotene are contained in the petroleum ether extract. Chromatographic analysis of such an extract may be employed provided a large quantity (50 gm.) of the dried plant material is used, and may be made once and for all for any given plant material. The proportion of α - and β -carotene thus established may be applied to figures for total carotene obtained in routine analyses employing but small samples of the plant material. Such analyses of spinach showed no loss of carotene upon preparation of the dehydrated product. Values for fresh spinach ranged from 0.0053 to 0.0061 percent and for the dried spinach from 0.048 to 0.058 percent. About 86 percent of the total carotene was found to be β -carotene.

Spectrophotometric and biological assay of vitamin A in oils, N. H. COX, H. L. SASSAMAN, and A. BLACK (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 2, pp. 74-76).—The procedure employed for the spectrophotometric assay of vitamin A in fish-liver oils is described in detail. The $E_{1\%}^{1\text{cm}}$ values obtained in assays of 53 such oils are recorded, together with biological values (units per gram) determined by the U. S. P. XI procedure. Conversion factors obtained by dividing the biological value by the E value were computed from the measurements on 22 cod-liver oils. These averaged 2,700 and 2,370 for the unsaponifiable fractions and whole oils, respectively. The average conversion factors for oils of higher potency were 2,260 for tuna-liver oils, 2,250 for halibut-liver oils, and 2,270 for miscellaneous oils (pollack, sword, and shark), giving an average of 2,260 for these oils of higher potency. Studies on U. S. P. reference oil showed that the E value gradually decreased when the oil remained in partially filled bottles, even though they had been flushed with CO_2 and stored in a refrigerator.

Chemical estimation of vitamin B₆ in foods by means of the diazo reaction and the phenol reagent, M. SWAMINATHAN (*Nature [London]*, 145 (1940), No. 3681, p. 780).—The method is based upon the fact that the vitamin with the hydroxy group in the β -position of the pyridine ring gives color reactions characteristic of true aromatic phenols. From 2 to 50 gm. of the material, containing from 10 to 20 rat units of vitamin B₆ (E. S. R., 76, p. 423), were finely minced or powdered and digested with pepsin for 24 hr. Protein and its derivatives were precipitated with tungstic acid, and purines, pyrimidines, and imidazole bases with silver nitrate and barium hydroxide. After removal of excess silver and adjustment to pH 1-2, the vitamin B₆ was adsorbed on clarite from which the vitamin was eluted with hot barium hydroxide. The silver precipitation was repeated on the eluate, which was then adjusted to pH 6, concentrated to 25 cc., and treated with sodium nitrite and acetic acid to destroy any amino group. The solution was finally adjusted to pH 7 and made up to 50 cc. Ten cc. aliquots were treated with diazotized sulfanilic acid, and the azo

color formed was estimated colorimetrically against a standard of 20 μ g. of pure vitamin B₆ treated in the same way. The method, applicable to all types of foodstuffs, was found to be highly sensitive, the color obtained was proportional to the amount of vitamin B₆ present, and recoveries of added vitamin ranged from 70 to 100 percent. It is pointed out that a variety of phenolic reagents may be used and that modifications in detail are possible.

A contribution to the question of the determination of nicotinic acid in urine, L. SCHINDEL (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 5, pp. 515-516).—It is pointed out that creatinine yields a red color with dinitrochlorobenzene, and that the use of this reagent in determinations of nicotinic acid in urine will lead to erroneous results unless a satisfactory method can be found for removal of urinary creatinine.

An assay method for pantothenic acid, D. PENNINGTON, E. E. SNELL, and R. J. WILLIAMS (*Jour. Biol. Chem.*, 135 (1940) No. 1, pp. 213-222, fig. 1).—The method described, which is a modification of that used by Snell et al. for the determination of pantothenic acid and riboflavin (E. S. R., 82, pp. 162, 587), "involves the response of *Lactobacillus casei* to pantothenic acid, and has been applied successfully to extracts of yeast, liver, milk, oysters, and mushrooms, to urine, and to chick tissues. Evidence as to its specificity in addition to that previously published is based upon the fact that different dosage levels yield results which are in agreement and the agent assayed is destroyed under conditions which destroy pantothenic acid. Pantothenic acid (concentrates) added to tissue extracts is 'recovered' quantitatively in the test."

Protection against oxidation in the determination of vitamin C [trans. title], A. OKRENT and K. WACHHOLDER (*Biochem. Ztschr.*, 306 (1940), No. 1, pp. 6-15).—Data are reported to show that metaphosphoric acid, as recommended by Fujita et al. (E. S. R., 76, p. 155) for protein precipitation and extraction of vitamin C, protects against loss by oxidation only in a concentration of not less than 7 percent. At this concentration, however, glutathione and cysteine have a not inconsiderable reducing action in the methylene blue method of Martini and Bonsignore (E. S. R., 73, p. 746). This latter error can be practically eliminated, however, by the use of 4.4 percent sulfosalicylic acid in place of the metaphosphoric acid.

Determination of ascorbic acid in citrus fruit juices, R. BALLENTINE (*Indus. and Engin. Chem., Analyt. Ed.*, 13 (1941), No. 2, p. 89).—The method, involving a direct titration with iodate in acid-iodide, is described as to reagents and procedure. Preliminary comparison of this method with the iodometric titration procedure of J. W. Stevens¹ and the indophenol titration procedure of Mack and Tressler (E. S. R., 73, p. 154) in determinations on synthetic crystalline ascorbic acid showed the indophenol and iodate titration methods to be in agreement, although absolute amounts were slightly high, while the double back-titration method of Stevens gave slightly low values. Data reported for citrus juices analyzed by the three methods indicated variable and high results by the Stevens method and agreement between the iodate and indophenol titration methods. Accuracy, stability of reagents, simplicity and rapidity, and reproducible results are advantages claimed for the iodate titration method.

Observations on the chick method of the assay of vitamin D.—I, Relative accuracy of group and individual ashing procedures and relation of chick weight to per cent bone ash, H. W. LOY, JR., J. B. DEWITT, and L. F. KNUDSEN. (*Jour. Assoc. Off. Agr. Chem.*, 24 (1941), No. 1, pp. 190-196, figs. 2).—The A. O. A. C. chick method for the assay of vitamin D (E. S. R., 85, p. 5) was subjected to critical study to compare the results of the individual and group ashing

¹ *Indus. and Engin. Chem., Analyt. Ed.*, 10 (1938), No. 5, pp. 269-271.

procedures and to determine the significance of the difference between the results for all chicks and for chicks weighing more than 100 gm. For the study of the two problems individual ash determinations were made on the right tibias of all chicks, regardless of weight, in a total of 12 separate experiments involving a total of 50 groups of approximately 23 chicks each. Vitamin D was given to the various groups at different levels varying from 0 to 30 units per 100 gm. of feed. "The results obtained indicate that the group ashing procedure is as reliable as the more laborious and involved individual ashing procedure. Statistical study of the data reveals a linear relationship between body weight and percent bone ash of chicks for all levels of vitamin D studied. The data obtained indicate that body weight should not be made a basis for discarding chicks in the vitamin D assay procedure."

The spectrophotometric determination of vitamins D₂ and D₃. C. H. NIELD, W. C. RUSSELL, and A. ZIMMERLI (N. J. Expt. Stas.). (*Jour. Biol. Chem.*, 136 (1940), No. 1, pp. 78-79, figs. 4).—A new reagent is described consisting of a solution of antimony trichloride and acetyl chloride in chloroform. The spectrophotometric procedure is outlined, and the absorption characteristics of the colored solution are discussed. The effective range of acetyl chloride concentration was found to be between 1 and 4 percent, and sensitivity remained constant with antimony trichloride concentrations varying between 15 and 30 gm. per 100 cc. of chloroform. Ethyl alcohol in concentration of 0.3 percent or less does not interfere with the reaction, but does decrease the sensitivity at a concentration of 0.7 percent or above. It is necessary, therefore, to wash, dry, and redistill the chloroform to eliminate the alcohol present as an impurity. The reagent, permitting the determination of as little as 0.2 γ of the vitamin, produces a yellowish-pink color with vitamins D₂ and D₃, this color reaching its maximum intensity in 30 sec. and being stable for from 4 to 5 min. The absorption curves of the reaction products of the reagent with vitamins D₂ and D₃ are identical, with the maximum at 500 m μ . The $E_{1\%}^{1\text{cm}}$ values at 500 m μ are identical for vitamins D₂ and D₃ and are approximately 1,800. The optical density of the colored solution is directly proportional to the vitamin concentration.

Another homolog of α -tocopherol [trans. title], P. KARRER and O. HOFFMANN (*Helvetica Chim. Acta*, 23 (1940), No. 6, pp. 1126-1131).—Diethylmethyltocopherol, synthesized by a procedure reported in some detail, was prepared as a bright yellow viscous oil with strong reducing properties. Purification was effected through conversion to the crystalline allophanate (m. p. 165° C.). The product is reported to exert full vitamin E activity in 10-mg. doses.

Convenient procedures for the preparation of antihemorrhagic compounds. L. F. FIESER (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 391-396).—The procedures outlined for the synthesis of a series of related compounds of antihemorrhagic activity, including vitamin K₁, represent simplifications and standardizations of known procedures previously reported. "The methods given are believed to be more convenient and more rapid than any previously described."

Estimation of prothrombin: A simplified method. H. W. FULLERTON (*Lancet* [London], 1940, II, No. 7, pp. 195-196, fig. 1).—The method employed is that of Quick² except that Styppen, a commercial preparation of Russell-viper venom, is substituted for tissue extract as the source of thrombokinase, and the plasma calcium solution and thrombokinase solution are used in volumes of 0.2 cc. rather than 0.1 cc. Data are cited to show that the results are similar to those obtained with tissue extract. Data and curves presented indicate the

² *Jour. Amer. Med. Assoc.*, 110 (1938), No. 20, pp. 1650-1662, fig. 1.

advantage of using dilutions of plasma as a more sensitive modification of the test. The use of physiological saline rather than prothrombin-free plasma as the diluent introduces the possibility of less uniform coagulation in the higher dilutions, due to low concentration of fibrinogen, but the formation of a small fibrin clot may be taken as the end point, this being readily observable with the use of Stypven, although such clot formation is sometimes difficult to recognize in the presence of tissue-extract solutions owing to their milky appearance.

Micro determination of some constituents of plant ash, M. E. WALL. (N. J. Expt. Stas.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 537-545).—For the determination of water-soluble mineral constituents, from 0.5 to 1 gm. of the pulverized plant material is refluxed with 100 cc. of distilled water for 1 hr. The residue is then filtered off and washed thoroughly with hot water. The filtrate is concentrated to about 50 cc. and made up to exactly 100 cc. For the determination of ash a like sample is incinerated by heating for 1 hr. at 600° C. in a muffle furnace. The ash is taken up in 50 cc. of 1:4 hydrochloric acid. Silica must be removed by evaporation, heating dry for 1 hr. on the water bath and again dissolving in dilute hydrochloric acid in the case of plants grown in soil. This precaution is not necessary if the plants have been grown in sand or in solution culture.

Phosphates, calcium, magnesium, potassium, and sodium are determined colorimetrically by adaptations of micro modifications of accepted methods. A micro volumetric determination of calcium is also described. Nitrates are determined on a decolorized aliquot of the water extract.

A rapid method for the separation of fat from milk for the determination of the refraction and other properties of the fat [trans. title], H. MULDER ([Netherlands] Dept. Landb. en Vissch., Verslag. Landbouwk. Onderzoek., No. 46 (13) C (1940), pp. [1]+505-514; Ger. abs., p. 514).—The method described is based on that of Golding (E. S. R., 78, p. 751).

[Fruit byproducts work by the Washington Station]. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 394 (1940), p. 34).—Work by A. M. Neubert on after-precipitation in clarified apple juice and on the effects of concentration and reconstitution and of enzyme clarification on the composition and properties of apple juice is briefly noted.

Manufacture of rum of the Jamaica type in Puerto Rico [trans. title], R. ARROYO. (P. R. Univ. Expt. Sta.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 32 (1940), No. 1, pp. 131-134).—The author describes the materials and processes used in making Jamaica rum, finding that the preparation of the mash is complicated and troublesome, the fermentation prolonged and inefficient, and the yield of commercial rum poor. It has been demonstrated that rum of the Jamaica type can be made in Puerto Rico by wholly scientific methods, depending on pure cultures of yeast, bacteria, and fungi. A method of manufacture is described.

AGRICULTURAL METEOROLOGY

Recurrent weather crises, A. SCHEMAUSS (*Res. and Prog.*, 7 (1941), No. 1, pp. 28-39).—"In the course of investigations conducted over a period of some 12 yr., proof of a certain calendarlike connection in our weather conditions which from time to time has been reported upon in '*Forschungen und Fortschritte*' was obtained." The author here summarizes the results of these investigations and reports on the latest developments in this branch of knowledge.

Timber and snow studies and snow surveying (*Nevada Sta. Rpt.* 1940, pp. 28-29).—A brief statement of objective, progress, and outlook in this project by J. E. Church and C. Elges.

Climatological data for the United States by sections (*U. S. Dept. Com., Weather Bur. Climat. Data. 27 (1940), Nos. 7-12, [about 225 pp., 2 pls., 8 figs. each]; 13, pp. [280], pls. 2, figs. 40.*—Nos. 7-12 contain for July to December 1940, the usual summaries and detailed tabular statements of climatological data for each State. In No. 13 summaries are given of climatological data for each month of 1940 and for the year as a whole for each State.

Climatological survey for Ohio and Wooster, J. T. McCLEURE (*Ohio Sta. Bimo. Bul. 209 (1941), pp. 81-82.*)—A summary and tabulation of 1940 weather data.

SOILS—FERTILIZERS

[**Soil investigations by the Alabama Station**] (*Alabama Sta. Rpt. 1939, pp. 9-15, 16-17, 18, fig. 1.*)—Subjects taken up are response of plants to magnesium and minor elements, by A. L. Sommer; evaluation of calcium silicate slags as agricultural liming materials, and effect of lime and boron on yields of successive crops on Vaiden clay, both by J. A. Naftel; nitrogen economy in different systems of soil and crop management, by R. J. Jones; the amount of potash required to maintain a constant level of replaceable potash in different Alabama soils, the relation between the amount of native replaceable potash in three Alabama soils and the increased yield of seed cotton produced by added potash, and the effect of winter legumes on the leaching of potassium, all by N. J. Volk; and a comparison of field-crop response and the amount of phosphorus in soil as determined by various tests for available phosphorus, by G. W. Volk.

[**Soil investigations by the Nevada Station**] (*Nevada Sta. Rpt. 1940, pp. 37-38.*)—This report notes a study, by V. E. Spencer, R. Stewart, and F. M. Willhite, of various organic and inorganic phosphates, with special reference to their ability to penetrate soils and to their positional and chemical availability to plants.

[**Soil investigations by the Tennessee Station**] (*Tennessee Sta. Rpt. 1939, pp. 12, 32-43.*)—This report takes up soil erosion, by N. D. Peacock; and calcium and magnesium conservation (coop. Va. Expt. Sta.), potassium fixation studies, lime+phosphate studies, sulfate recovery studies, nitrogen-conservation studies, solubility of calcium silicate slag, and cooperative fertilizer studies with phosphatic materials, all by W. H. MacIntire and W. M. Shaw.

[**Soil investigations by the Washington Station**]. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 394 (1940), pp. 21-27, 106-108.*)—The following work is reported upon briefly: The maintenance of organic matter in eastern Washington soils, by S. C. Vandecaveye, L. C. Wheating, and L. T. Kardos; plant composition as influenced by fertilizers and soil type, by Vandecaveye and L. C. Dunn; fertility investigations of greenhouse soils, by Wheating and Dunn; the effect of various cropping systems in the Palouse region upon the leaching through the soil of plant nutrients and other chemical constituents, by Kardos and Vandecaveye; changes occurring in irrigated soils in the Wenatchee and Yakima Valleys as a result of irrigation and fertilizer treatments, by Vandecaveye and Wheating; investigations of the causes and remedies of the unproductiveness of certain soils following the removal of mature trees, with special reference to arsenic toxicity, by Kardos, Vandecaveye, and N. Benson; fertility of irrigated soils, by Vandecaveye, Wheating, and H. P. Singleton; soil erodibility, effect of plant cover on run-off and erosion, and relation of cropping practices to erosion control, all by G. M. Horner; and tillage practices for erosion control and run-off from agricultural watersheds, both by Horner and L. M. Naffziger.

[Soil investigations by the Western Washington Station] (*Western Washington Sta. Rpt. 1940*, pp. 52-53, 56-58).—The comparative value of different phosphates for western Washington soils was studied by K. Baur and L. C. Wheeting (coop. Wash. Expt. Sta.); and the comparative value of several nitrogenous fertilizers for western Washington soils, soil adaptability and fertility, and minor elements, all by Baur.

[Soil investigations by the Wisconsin Station]. (Partly coop. U. S. D. A., Univ. Minn., et al.). (*Wisconsin Sta. Bul. 451 (1941)*, pp. 92, 95-96, 98-99, 101-107, fig. 1).—This report notes work by A. R. Albert on the value of lime for sandy soils, and on the value of phosphates and potassium for crops in Door County; by L. O. Fine, T. A. Bailey, and E. Truog on the effects of freezing and thawing on soil potassium; by E. J. Delwiche, D. H. Holt, and L. E. Muskavitch on need for drainage of red clay soils; and by O. E. Hays and H. B. Atkinson on the value of terracing in soil conservation. How erosion affects soil and crops is discussed by Hays, C. O. Rost, and H. H. Hull, and the effect of grazing in causing deep frost penetration by R. G. Neu.

Structural characteristics of peat and muck, A. P. DACHNOWSKI-STOKES. (U. S. D. A.). (*Soil Sci.*, 50 (1940), No. 5, pp. 389-399, pl. 1).—The author discusses stratigraphic features of peat areas, structural forms of peat material, and some special characteristics of the structure of Alaskan peats, briefly summarizing the peat investigations of the last decade.

Studies in the degree of dispersion of the clays.—IV, The shapes of clay particles, C. E. MARSHALL. (Mo. Expt. Sta.). (*Jour. Phys. Chem.*, 45 (1941), No. 1, pp. 81-93, figs. 2).—The author used the effect of the orientation of suspended nonspherical particles by flow upon the intensity of the diffracted beam to obtain qualitative indications concerning the particle shape of various clay minerals. He found that for the clay minerals montmorillonite, beidellite, illite, kaolinite, and halloysite, particles larger than 100 $m\mu$ are definitely platy and probably have only slight elongation. He also combined sedimentation velocities with ultramicroscopic counts in order to determine the major and minor axes of the plates regarded as flattened ellipsoids of rotation, and determined that the orientation of the optical and electrical ellipsoids for all the clays examined is such that the larger axes lie approximately in the plane of the plates. The preceding papers of this series were not noted.³

Concretions and refractory deposits in some Natal coastal soils, B. E. BEATER (*Soil Sci.*, 50 (1940), No. 5, pp. 313-329, pls. 2).—The author presents a tentative classification of these materials into seven groups of strictly concretionary material and an eighth group of "miscellaneous fragments of shale sandstone and other materials which have absorbed iron and formed a thin polished layer over their surfaces, but which do not strictly enter into this classification." Soil type and composition, climate, and topography are considered the three main factors influencing the formation of concretions. The importance of these secondary structures, from the viewpoint of classification, is emphasized. They are very abundant and "cannot be disregarded in any systematization of soil groups."

A microscopic method for determining the water-stable aggregates in soils, J. B. PETERSON. (Iowa State Col.). (*Soil Sci.*, 50 (1940), No. 5, pp. 331-338, figs. 4).—A method depending on the counting of the aggregates in a projected microscopic field is proposed, the sample being first slaked in water, drained by siphoning, and suspended in glycerol. Samples of from 1 to 2 gm.

³ Jour. Soc. Chem. Indus., Trans., 50 (1931), pp. 444T-450T, 457T-462T; Soil Sci. Soc. Amer. Proc., 4 (1939), pp. 100-103.

per liter were found to give the desired concentration of from 0 to 10 particles per field. The glycerol suspensions were poured for microscopic projection into crystallizing dishes 70 mm. in diameter to a depth of from 10 to 20 mm. For the size range from 0.05 to 1 mm, a magnification of 100 diameter⁻¹ was found suitable. The depth of the suspensions was determined by means of a pointer attached to the coarse adjustment of the microscope and moving over a circular scale calibrated in millimeters. The method was found to have the advantage of causing little or no change in the morphology of the natural soil aggregates.

Ionic size in relation to fixation of cations by colloidal clay, J. B. PAGE and L. D. BAVER. (Ohio State Univ.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 150-155, fig. 1).—In a mechanism proposed to explain the fixation of potassium, caused by drying, the size of the ion and the contraction of the variable lattice of the montmorillonitic clay minerals are shown to be the important contributing factors. Experiments on a bentonite colloid and the colloid from the Miami silt loam show that the bentonite colloid does not fix potassium as readily as the Miami colloid, and that the fixed potassium is slightly affected by concentration of the replacing ion. It is also shown that large cations, when between the sheets, can prevent the sheets from coming together and fixing potassium. Univalent and divalent cations were tested, and it was found that the ionic sizes close to the size of certain free spaces within the lattice were closely correlated with susceptibility to fixation.

Base exchange capacity and related characteristics of Connecticut soils, M. F. MORGAN. (Conn. [New Haven] Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 145-149, figs. 5).—The author obtained data showing that the base exchange capacities of Connecticut soils tend to be consistent with soil type, ranging from about 2 moisture equivalents per 100 gm. for soils of very sandy texture and low organic content to over 15 moisture equivalents for clay loam soils that are moderately high in organic matter. He also shows that base exchange capacity is strongly correlated with moisture equivalent, the latter expressed as percent being approximately 19 times the former, expressed as moisture equivalent per 100 gm. However, at the higher base exchange capacities the moisture equivalent becomes relatively lower than thus indicated. The base exchange capacities of most Connecticut soils are influenced more by organic matter than by clay content. Correlations between clay and base exchange capacity are obscured by variations in organic matter. There is a slight degree of direct correlation between clay and moisture equivalent.

Calculations of base exchange capacity from determinations of organic matter and clay contents indicate average base exchange capacities of 175 for the former and 35 for the latter. However, such calculations appear to be less reliable than the base exchange capacity-moisture equivalent relationships.

Lime requirement estimates from pH measurements can be made with a fair degree of accuracy. Apparent or determined organic content and textural class provided the basis for an estimate of total base exchange capacity. The pH and degree of base saturation are definitely correlated, hence one can thus approximate the amount of lime required to produce the desired improvement in base saturation for the soil in question.

Volume change of soils in relation to their infiltration rates, G. M. BROWNING. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 23-27).—The author tabulates for a wide variety of soils the percentage of volume change with change in the moisture content, infiltration rate, percentages of particles smaller than 0.002 mm. and of organic matter, volume weight, and percentage of aggregates larger than 0.22 mm. He shows that in the surface samples there is apparently no significant correlation between volume

change and the infiltration rate. In subsoil samples the relation appears curvilinear, the soils having percentage volume changes less than 20 percent showing a distribution in infiltration rate from 0 to 1.42 in. per hour, while the soils with volume changes greater than 20 percent have extremely low infiltration rates, the range being from 0 to 0.13 in. per hour, with most of the infiltration rates approaching zero.

Dissociation in *Azotobacter chroococcum* (Beijerinck), C. B. LIPMAN and E. McLEES. (Univ. Calif.). (*Soil Sci.*, 50 (1940), No. 5, pp. 401-407, pls. 2).—Repeated plating resulted in the dissociation of a pure culture of *A. chroococcum* into four distinct strains, of which the most constant and striking formed black and dry colonies. The colonies of the several strains were, respectively, black and dry, light brown or cinnamon colored and striated from center to edge, white with a tendency to spread into streamerlike masses, and brown with a mucilaginous texture. Other characteristics of the colonies and of the individual cells, including staining reactions, are described. The physiological aspects of these variants are discussed briefly.

Land use in relation to sedimentation in reservoirs, Trinity River Basin, Texas, A. N. GARY and L. P. GABBARD. (Coop. U. S. D. A.). (*Texas Sta. Bul.* 597 (1941), pp. 65, figs. 2).—The feasibility of controlling the water flow and silt transportation by a systematic treatment of watershed lands is discussed, and the benefits to be derived are indicated. Unsound land use was found to have caused an excessive increase in reservoir silting, the total annual damage in the area specifically discussed being about \$165,000, due to loss of storage capacity, pollution, etc. As an example, it is pointed out that Kaufman Lake is silting at the rate of 6.6 acre-ft. per year. At least half of this damage could be prevented by proper erosion-control measures applied in the watershed areas.

Less soil erosion on plots seeded to close growing cover crops, I. E. HAMBLIN. (Coop. U. S. D. A.). (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 5, p. 7).—Soil losses in pounds per acre were found to be much less after crotalaria was planted. The importance of cover crops for the protection of steep slopes is emphasized.

Save the soil with contour farming and terracing, E. W. LEHMANN and R. C. HAY (*Ill. Agr. Col. Ext. Cir.* 518 (1941), pp. 44, figs. 42).—This circular emphasises the well-known advantages of contour farming and terracing and presents practical information on systems of contour plowing and planting, planning contour and terrace systems, locating and marking the lines, grass waterways and terrace outlets, constructing the terraces, maintaining a terrace system, and cost of terracing. An appendix deals with the use and care of the level.

A comparison of the effect of certain cropping and fertilizer and manuring practices on soil aggregation of Dunmore silt loam, J. ELSON. (Va. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 5, pp. 339-355, pl. 1, figs. 4).—Using a wet screening apparatus, the author found that the size distribution curve of the soil aggregates and "relative surface" gave a more complete picture of the aggregate condition of the soil than did the percentage soil aggregation.

The continuous growing of corn or wheat reduced the percentage both of soil aggregation and of aggregates > 1 mm. The manuring of continuous corn or wheat plots resulted in an increase in soil aggregation over the corresponding check plots. The soil of plots under hay for 30 yr. was better aggregated than that of plots continuously cropped to corn or wheat. The percentage soil aggregation remained the same during a 4-yr. rotation of corn, wheat, clover, and hay when no manure or fertilizer was applied to the soil, but the hay plots contained a higher percentage of aggregates > 1 mm. In the same 4-yr. rotation, when all

crops were fertilized or manured, the soil of the clover and hay plats had a higher percentage of soil aggregation and of aggregates > 1 mm. than the soil under corn or wheat. The soil of plats in sod for 30 yr. was as well aggregated as in fertilized or manured plats of clover or hay in a 4-yr. rotation.

The soil of rotated check hay plats had less organic matter and a higher percentage of the total soil organic matter in the 1-mm. aggregates than did the soil from rotated check corn, wheat, or clover plats. Organic matter applied in the form of stable manure directly to cornland was not tied up completely with the 1-mm. aggregates.

The soil under the rotated manured corn plats had a greater exchange capacity and a lower percentage hydrogen saturation than did the soil under the hay plats in the same rotation. The soil of the rotated check hay plats contained less Ca and Mg and soluble sesquioxides than did the soil from corn, wheat, or clover plats.

Organic phosphorus in seven Iowa soil profiles: Distribution and amounts as compared to organic carbon and nitrogen, R. W. PEARSON and R. W. SIMONSON. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 162-167, figs. 3).—The authors determined organic phosphorus by a method consisting essentially in removing exchangeable bases, digesting the soil in ammonia solution, and determining phosphorus (1) in a decolorized aliquot of the filtered extract and (2) in a second aliquot ignited without decolorizing, the difference between the phosphorus contents of these aliquots being considered organic phosphorus. The soil profiles examined represented Prairie, Planosol, Wiesenboden, and Gray-Brown Podzolic groups. The quantities found ranged from 205 p. p. m. to 393 p. p. m. in the surface layers, but they were as low as 8 p. p. m. in the C horizons of some soils. The proportion of total phosphorus present in organic form ranged from 35.4 percent in the plow-layer of the Wiesenboden profile to 72.6 percent in the A₁ horizon of the Fayette silt loam, a Gray-Brown Podzolic soil. The ratios of organic phosphorus:organic carbon and nitrogen were found to vary considerably within individual profiles as well as from one soil to another. Smaller variations occurred in the nitrogen:phosphorus ratio than in the carbon:phosphorus ratio.

Nitrate fertilizer additions to waterlogged soils in relation to oxygen deficiency, F. M. BAIN and H. D. CHAPMAN. (Calif. Citrus Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 5, pp. 357-367, pls. 2).—In Ramona loam kept in a waterlogged condition in greenhouse pots, the addition of calcium nitrate was definitely harmful to avocados. Added ammonium sulfate was injurious both to avocados and to grapefruit. Drainage water analyses indicated a rather rapid denitrification. The experiments gave no indication of any tendency of the added nitrate to offset the effects of oxygen deficiency.

Enough nitrogen everywhere except in the soil, G. D. SCARSETH. (Ind. Expt. Sta.). (*Better Crops With Plant Food*, 24 (1940), No. 5, pp. 20-22, figs. 2).—This is a brief popular article, presenting graphically land use and nitrogen relationships and the behavior of some nitrogen compounds in the soil.

Potash deficiency in New England, T. E. ORLAND. (R. I. Expt. Sta.). (*Better Crops With Plant Food*, 24 (1940), No. 5, pp. 6-9, 38-39, figs. 4).—A plat given phosphates and nitrogen but no potassium, and of good fertility at the beginning of the experiments discussed, furnished yields so low as to be practically failures after 16 yr. Plats treated with fertilizers of low potassium content produced, in 1939, 226 bu. per acre of potatoes, with medium quantities of potassium 264 bu., and with high potassium 312 bu. per acre. The corresponding results with onions were 206, 393, and 526 bu., respectively. All other crops grown showed similar indications. The quality of several crops, especially

that of potatoes, was markedly improved by liberal use of potassium compounds. Some crops gave slightly better yields with potassium sulfate than with the chloride. With other crops the chloride gave slightly better results.

Chemical composition of sugarcane juice as affected by fertilizers, N. McKaig, Jr., and L. A. Hurst (U. S. Dept. Agr., Tech. Bul. 754 (1941), pp. 64, figs. 22).—Cane was grown on several Louisiana soil types all poor in nitrogen, and perhaps requiring some potassium and phosphate also for best yields. Fertilizer application experiments of three types were carried out, and various components of the cane were chemically determined. Fertilizers were applied (1) in various combinations of sodium nitrate, potassium chloride, and superphosphate such that the total plant-food application was always 60 lb. to the acre, (2) at the rates of 200, 400, 600, and 800 lb. to the acre of each of six formulas such that the plant-food applications were, respectively, 40, 80, 120, and 160 lb. to the acre, and (3) in comparative experiments on sources of nitrogen.

Fertilization with sodium nitrate generally was followed by a decrease in the total solids, sucrose, purity, acidity, pH value, ash, phosphate, sulfate, chloride, potash, sodium, and probably the manganese content of the juice and juice solids and an increase in the nonsucrose solids, reducing sugars, calcium, total nitrogen, protein nitrogen, nonprotein nitrogen, and proportion of nonprotein nitrogen. Superphosphate increased the ash content of the juice and juice solids, apparently by causing a large increase in the sulfate concentration. This material also increased the potash content of juice slightly and probably increased the manganese. It did not significantly change the total solids, sucrose, purity, nonsucrose solids, reducing sugars, total nitrogen, protein nitrogen, pH value, silica, phosphate, or chloride, but decreased the acidity, and possibly the calcium and magnesium content of the juice and juice solids of the samples analyzed. Potassium chloride increased the total solids, sucrose, purity, pH value, ash, chloride, potash, and manganese in the juice and juice solids, and the chloride and potash content of the juice ash compared with the quantities present in similar but unfertilized samples. This fertilizer did not influence the total nitrogen, protein nitrogen, nonprotein nitrogen, silica, or sulfate content of the juice and juice solids, nor the sulfate content of the ash. It decreased the nonsucrose solids, reducing sugars, acidity, sodium, and possibly the magnesium content of the juice and juice solids, also the proportion of silica, phosphate, sodium, calcium, and magnesium in the ash. Comparisons of several common nitrogen fertilizers showed that all act in the same manner, although to a degree different with respect to their influence on certain juice components, but have specific action on other components. Numerous other effects of the various treatments are recorded.

Fertilizing value of garbage tankage and sewage sludge, E. E. Barnes (Ohio Sta. Bimo. Bul. 209 (1941), pp. 39-44).—The garbage product showed a very low fertilizer value in the pot experiments here reported. At the application rate of 10 gm. to the pot of 4,200 gm. of soil the sewage-sludge fertilizer increased the yield to about 18 percent more than those given by the soil without fertilizer. The quantities of nitrogen, phosphate, and potassium, the same as those in the sludge, when applied in the forms of sodium nitrate, superphosphate, and potassium chloride resulted in yields 56 percent greater than those from the untreated soil, however, and when the sodium nitrate nitrogen was reduced to less than 20 percent of the sludge nitrogen the yield still remained higher than from the sludge-treated soil. On soils deficient in manganese, copper, zinc, or boron these organic materials may be of some value.

The guarantee tag shows the value of fertilizer material, R. Coleman (Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 4, pp. 1, 7).—The information

given on fertilizer bags and tags is discussed in detail, including brief notes on acid-forming and non-acid-forming fertilizers.

AGRICULTURAL BOTANY

Plant culture equipment, F. M. EATON. (U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 385-392, figs. 4).—Detailed descriptions are given of small sand and water culture equipments, also of large out-of-doors sand cultures both of tree and annual crops constructed at the U. S. Regional Salinity Laboratory, Riverside, Calif. In general, the features of the latter are like those previously described (E. S. R., 76, p. 305), but the more significant modifications are described.

Automatic watering of experimental plots, K. POST. (Cornell Univ.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 207-209, figs. 2).—Using a watertight bench, a vacuum gage connected to a tensiometer, and the latter operating a relay which controls a solenoid valve injecting water into tiles in the bench, the method described and illustrated is said to be satisfactory for studies necessitating equal moisture in all parts of the plots.

A press for recovery of fluids from plant tissues, T. C. BROYER and A. H. FUERNSTAL. (Univ. Calif.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 419-421, fig. 1).—A detailed description and reproduction of the design are presented.

Another circuit for temperature controls, B. NOYES (*Science*, 93 (1941), No. 2412, pp. 286-288, fig. 1).—The successful use of a mercurial thermometer into which platinum contact wires have been placed for controlling temperatures in ovens and chambers employed for biological and chemical processes is reported. When used with the ordinary relay and without an auxiliary circuit, the surface of the mercury is soon contaminated and separation of the column results. Thermionic tubes were found to eliminate this difficulty but to complicate the circuit, making some technical supervision and maintenance necessary. A circuit has been developed and is here described and illustrated which appears just as satisfactory and somewhat cheaper and easier to assemble.

Another method for recording localities from topographical maps, L. HUBRICHT and R. O. ERICKSON (*Science*, 93 (1941), No. 2412, p. 288).—A simple triangulation method is described which can be used on any map regardless of size or latitude.

Financing a taxonomic journal, F. R. FOSBERG (*Chron. Bot.*, 6 (1940), No. 3, pp. 55-56).—The alternative is for the agencies paying for the taxonomic research to pay for placing the results on record through publication.

Selected references on current research in plant taxonomy, ecology, and geography in Europe, Africa, Asia, and Australia, [I], II (*Chron. Bot.*, 6 (1941), Nos. 12, pp. 265-287; 13, pp. 298-311).

Economic annuals and human cultures, O. AMES (*Cambridge, Mass.: Harvard Univ. Bot. Mus.*, 1939, pp. VII+153, pls. 2, figs. 46).—This monograph takes up the significance of the angiosperm seed, antiquity of economic annuals, economic plants through the Pleistocene, the more important economic annuals, and plants as measures of cultural time.

Botanical problems in boreal America, I, II, H. M. RAUP (*Bot. Rev.*, 7 (1941), Nos. 3, pp. 147-208; 4, pp. 209-248).—This monographic ecologic review (nine-page bibliography) deals with the explorations, physiographic history, and climate of the area, and in detail with the origin and distribution of the flora and the development and distribution of plant communities therein.

A review of the botanical drug situation in the United States, F. H. EBY (*Amer Jour. Pharm.*, 113 (1941), No. 2, pp. 45-57).—A general survey of the possibilities of the collection and cultivation of drug plants in the United States, in view of the present drastic reduction in the supply of certain crude drugs.

Analytical key to the genera of plants thus far known to occur in Venezuela, H. PITIER (*Clave analítica de los generos de plantas hasta hoy conocidos en Venezuela. Caracas: Tipog. Amer., 1939, pp. 354*).—Pteridophytes and Spermatophytes are included.

Taxonomy and floristics of tropical and South Africa, E. A. BRUCE (*Chron. Bot., 6 (1941), No. 11, pp. 253-254*).—A review, with 45 references.

Field characters distinguishing *Pinus ponderosa* and *Pinus jeffreyi*, K. E. BRADSHAW. (U. S. D. A.). (*Madroño, 6 (1941), No. 1, pp. 15-18*).

The cacti of Arizona, L. BENSON ET AL. (*Aris. Univ. Bul., 11 (1940), No. 1, pp. 134, pls. 53*).—A semitechnical manual for identification of the native cacti of the State.

Three species of *Pythium* with proliferous sporangia, C. DRECHSLER. (U. S. D. A.). (*Phytopathology, 31 (1941), No. 6, pp. 478-507, figs. 18*).—*P. oedochilum* and *P. palingenes* are said to resemble *P. helicoides* in the generally symmetrical conformation and proliferous development of their sporangia. However, the latter, owing to infrequency of distal branching in the supporting hyphae, are rarely borne in corymbose arrangement. Asexual reproduction in *P. palingenes* is often characterized by abundant iterative swarming. The sexual reproduction of *P. oedochilum* and *P. palingenes* shows parallelism with that of *P. helicoides*, not only in the longitudinal application of elongated antheridia to oogonia that often protrude along the regions of contact but also in the distinctively multiplicate internal structure of the ripe oospore. Helicoid involvement of the oogonial hypha by an antheridial branch, such as is associated with every unit of sexual apparatus in *P. helicoides*, occurs very rarely in *P. oedochilum* and is concomitant with about one-third of the sexual units in *P. palingenes*.

A fungus isolated from affected portions of waterlily leaves is described in detail as *P. marsipium* n. sp. Proliferous development of sporangia occurs under thoroughly aquatic conditions. As the fungus produces oospores of unitary internal structure, it must be regarded as alien to the *helicoides* series.

Root nodule formation and nitrogen fixation in leguminous plants, H. L. JENSEN (*Austral. Jour. Sci., 3 (1941), No. 4, pp. 98-99*).—*Rhizobium meliloti* produced nodules on *Medicago* spp. from about pH 5.3 to pH 8 and above; *R. trifolii* acted thus over a much wider range. "Bacterization" of the soil or seed with *Acetobacter* did not appear to influence either directly or indirectly the nitrogen fixation by alfalfa. No evidence could be found that molybdenum has any specific influence on nitrogen fixation by clover or alfalfa.

Respiratory enzyme systems in symbiotic nitrogen fixation.—III, The dehydrogenase systems of *Rhizobium trifolii* and *Rhizobium leguminosarum*, R. K. TAM and P. W. WILSON. (Hawaii. Pineapple Prod. Expt. Sta. and Univ. Wis.). (*Jour. Bact., 41 (1941), No. 4, pp. 529-546, figs. 5*).—In continuation of this series (*E. S. R., 80, p. 21; 84, p. 17*), the dehydrogenating activity of two strains each of *R. trifolii* and *R. leguminosarum* by a modified Thunberg method described was found to occur at pH 4-10, with optimum at pH 8-8.2. Some substrates (e. g., glucose and lactate) possessed two optima, suggesting the introduction of a secondary system with a higher pH optimum than the primary one. The temperature and energy relations of the strains were also studied. All strains activated a large number of diverse organic compounds. Potassium cyanide and sodium pyrophosphate stimulated the action of the dehydrogenases studied, whereas sodium azide and sodium iodoacetate were powerful inhibitors and sodium fluoride was inhibitory only at a high concentration. The inhibitory effects of several other compounds are also noted. Alpha-methyl glucoside appeared to be a good substrate and was noninhibitory at all concentrations tested.

Aspects of progress in the study of plant nutrition, D. R. HOAGLAND. (Univ. Calif.). (*Chron. Bot.*, 6 (1941), No. 15, pp. 345-346).

The cell and protoplasm, edited by F. R. MOULTON (*Lancaster, Pa.: Science Press*, 1940, pp. [5]+205, figs. 53).—In this symposium (see p. 461) following papers are of interest to botany: The Cell and Protoplasm, by C. V. Taylor (pp. 1-5); The Walls of Plant Cells, by I. W. Bailey (pp. 31-43); The Biochemistry of Micro-organisms—An Approach to General and Comparative Biochemistry, by C. B. van Niel (pp. 106-119); Plant Hormones, by F. W. Went (pp. 147-158); and Molecular Structure in Protoplasm, by O. L. Sponsler (pp. 166-187) (Univ. Calif.).

Relation of the effects of growth-promoting substances to photo-synthetic activity, the mass law of growth and seed germination, S. W. OEXEMAN. (Univ. Ill.). (*Ill. State Acad. Sci. Trans.*, 33 (1940), No. 2, pp. 84-86, fig. 1).—Results of the limited experiments outlined appear to indicate a correlation between growth substances on the one hand and photosynthetic activity and the mass law of growth on the other. Treatment of seeds with growth substances in most cases resulted in a retarded and lowered germinability and a slower growth rate of the seedlings.

Effects of talc and phytohormone treatment on the rooting of dahlia cuttings, N. H. GRACE (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. C, pp. 40-41).—When cuttings untreated, talc treated, and treated with talc containing various concentrations of naphthylbutyric acid were propagated in sand in the greenhouse, all of the first lot and only 4 percent of the second lot died. Although the growth substance treatment increased the number of roots per rooted cutting, it also increased the mortality to 23 percent and there was no significant difference in the effects of different concentrations. Reduction of mortality by talc was the outstanding result obtained.

Production of auxin by bakers' yeast, T. W. ROBINSON and T. J. B. STEER. (Univ. Ill. et al.). (*Chron. Bot.*, 6 (1940), No. 3, pp. 51-52).—Appropriate media gave higher auxin yields than the cells growing therein.

On vitamins in wheat germ, H. H. BUNZELL (*Science*, 93 (1941), No. 2410, pp. 238-239).—Wheat germ made from hard spring wheat was found to contain a component stimulating the action of yeast to a greater extent than could be explained by its known vitamin content.

Wheat species characterized according to activity and quality of amylase in their grain, M. I. KNIAGINICHEV, I. F. MUTTL, and J. K. PALILOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 9, pp. 1020-1023).

Physiological condition of cereals in connexion with the processes of heading and flowering, F. D. SKASKIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 9, pp. 1042-1044).—Based on the literature and on experiments with oats, it is believed that the great sensitiveness of plants to water deficiency in the environment during heading and flowering is linked with the alternation of generations and the transition from the more drought-resistant sporophyte phase to the less resistant gametophyte phase.

Concerning the upward movement of soil solutes, T. G. MASON and E. PHILLIS (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 16, pp. 765-771, fig. 1).—Assuring the water supply to the leaves in sea-island cotton plants in which the continuity of the wood was broken at the base of the stem by a side root grafted into the stem above the break, the uptake of both N and Br by the roots was greatly reduced as a result of cutting the wood. All the N absorbed by the root of the normal plant traveled into the foliage region, but only 79 percent of that absorbed by the "cut-wood" roots did so. For Br these percentages were 76.5 and 18, respectively.

Comparison of rates of water intake in contiguous regions of intact and isolated roots, H. F. ROSENE (*Plant Physiol.*, 16 (1941), No. 1, pp. 19-38, figs. 7).—Using a previously described technic (E. S. R., 77, p. 598), the experiments on intact and excised roots of corresponding age, length, and history carried out under comparable conditions of humidity, temperature, and light showed similar characteristics of behavior in water absorption with respect to localization of highest rates in relatively more basal regions, an over-all increase of rates at each level with time throughout 12 2-hr. intervals and fluctuations of rates in contiguous regions and in the axial gradient of distribution under constant external conditions. The rates of water intake at contiguous levels of the same root after excision were equal to, greater, or less than before excision. Both intact and excised roots which had been killed exhibited pronounced irregularities of water intake in contiguous regions, and both liquid loss and uptake occurred at different levels during the same period. The living root in position delivered more water than the same root when dead.

Some comments on the mechanism of phloem transport, T. G. MASON and E. PHILLIS (*Plant Physiol.*, 16 (1941), No. 2, pp. 399-404).—A review, with 22 references.

Significance of phloem exudate of *Ocucurbita pepo* with reference to translocation of organic materials, B. J. COOIL (Hawaii Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 61-84, figs. 2).—Using strongly vegetative young plants low in carbohydrates, older fruiting plants deficient in neither carbohydrates nor N, and plants deficient in N but of the same age as the latter, it was found that they represented three distinct metabolic states, as shown by type of growth, leaf color, length, weight, protein, sugar, and total-solid contents. Translocation was demonstrated in the minus-nitrate group by accumulation of sugars in the petioles, which were covered with black paper. In the other two groups sugars did not accumulate there, and because of the growth behavior translocation was known to be rapid. The sieve tubes seemed to be the chief source of solid materials in the exudate, and in all cases the latter was apparently diluted with extra-sieve tube water. Sugar concentrations in the exudate were lower than any of those which have been used as a basis for calculating rates of flow of solution in the phloem. An active sieve tube protoplasm was indicated by high protein and soluble N contents in the exudate and by an apparent accumulation of sugars against a gradient in young plants. The sugar content of the exudate was not related to that of the associated tissue but appeared to be correlated with the metabolic level of the plants. Consideration of the effect of cutting the petiole on tissue-pressure equilibria in the plant is believed to give a plausible explanation for exudation as well as differences therein. The amount of exudate from a cut petiole did not depend on translocation or on the sugar concentration of the exudate. The data presented but little evidence of a "pressure flow" mechanism in the phloem.

The essential nature of molybdenum for the growth of higher plants, P. I. ARNON. (Univ. Calif.). (*Chron. Bot.*, 6 (1940), No. 3, pp. 56-57).

Response of *Phymatotrimum omnivorum* to certain trace elements, L. M. BLANK. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 3, pp. 129-159, figs. 3).—Studying the response of *P. omnivorum* to certain trace elements by the factorial design method, Al, B, Cd, Co, F, Hg, I, Li, Mo, Ni, and Si were found to be nonessential, whereas Zn, Fe, Mn, and Cu proved necessary for optimum growth, the last being desirable for the purified solution only. In the unpurified solution marked increase in growth resulted when Fe, Mn, and Zn were present at 2 or 5 p. p. m. for each element.

Much greater growth resulted than could be accounted for by the summation of their effects when used singly, and highly significant interactions were noted.

The salt relations of plant tissues.—II, The absorption of manganese salts by storage tissue, W. STILES and A. D. SKELDING (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 16, pp. 673-700, figs. 6).—The absorption of both ions of chloride, sulfate, and nitrate of Mn by root tissue was followed for 4-8 days from solutions with initial concentrations of 0.02-0.0002 M by methods described. With the same concentration the absorption followed much the same course for all three salts. In each case the Mn followed a two-phase course involving an initial one of rapid absorption to a position of temporary equilibrium reached in about 7-8 hr., followed 12-24 hr. later by a second phase of slow continuous absorption still proceeding at the end of the experiments. With stronger solutions Mn absorption nearly or quite ceased after 3-4 days. The two-phase course was not generally observable for the anion. The rate of absorption of both ions decreased as the concentration increased, the effect being much more pronounced than for K salts (*E. S. R.*, 83, p. 748). Although the relation between concentration and intake was the same as for that of adsorption, the further absorption of Mn following renewal of external solutions was greater than would occur if the amount of absorption was solely conditioned by adsorption. The data indicated that exchange of ions between external solution and tissue plays a large role in determining the amount of Mn absorbed during the first phase. The at present obscure factors determining the second phase are discussed.

Studies on the partition of the mineral elements in the cotton plant.—II, Preliminary observations on potassium, calcium, and magnesium, E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 16, pp. 773-783, figs. 6).—The preceding contribution⁴ presented preliminary observations on N and P.

The effect of salt concentration upon the metabolism of potato discs and the contrasted effect of potassium and calcium salts which have a common ion, F. C. STEWARD and C. PRESTON (*Plant Physiol.*, 16 (1941), No. 1, pp. 85-116, figs. 3).—In continuation (*E. S. R.*, 84, p. 187), the effect of a range of salt concentrations on respiration and metabolism of potato discs was studied, using bromides, chlorides, and nitrates of K and sulfates of Ca and K. The effect of salt concentration on starch hydrolysis was slight, the tendency being for increased concentration of K salts to decrease and for Ca salts to increase it. Increased external concentrations of K salts increased respiration and all other reactions favored by O₂, whereas corresponding concentrations of Ca salts with a common anion depressed these processes. The salt concentrations inducing high respiration did not produce high sugar content. High respiratory rates and low sugar content obtained in tissue exposed to strong K salts, whereas the converse was true for Ca salts. Thus, sugar content does not determine respiration. The effective ions of the salts are the cations, and their specific effects are accentuated by the anions in the order NO₃>Cl>Br>SO₄, which is also the order in which they influence absorption of a common cation. The effects of salts on respiration were found closely connected with their effect on protein synthesis from stored amino acids, K salts stimulating and Ca salts depressing both processes.

Antagonistic action of chlorides on the toxicity of iodides to corn, J. C. LEWIS and W. L. POWERS. (Oreg. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 393-398).—Adding 20 p. p. m. of chlorides partially prevented the toxic action of 2 p. p. m. of iodides on corn in solution cultures. The I content

⁴*Ann. Bot. [London]*, n. ser., 3 (1939), No. 11, pp. 563-585, figs. 7.

of the corn was not affected by the chloride concentration in the solutions, but the Cl content was increased markedly in the presence of 2 p. p. m. of iodides. The iodide-chlorine antagonism appeared to be independent of Fe deficiency.

Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide, and sulphur dioxide gases.—I, General methods and correlations, S. E. A. McCallan and C. SETTERSTROM. II, Fungi and bacteria, S. E. A. McCallan and F. R. WEEDON. III, Green plants, N. C. THORNTON and C. SETTERSTROM. IV, Seeds, L. V. BARTON. V, Animals, F. R. WEEDON, A. HARTZELL, and C. SETTERSTROM (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 5, pp. 325-330, fig. 1; pp. 331-342, figs. 4; pp. 343-356, figs. 5; pp. 357-363, fig. 1; pp. 365-385, figs. 4).—These papers represent a series of cooperative tests in which a survey was made of the relative toxicities of these five common industrial gases to various forms of plant and animal life. The apparatus employed permitted a continuous flow of gas at definite concentrations, and it is believed that this is the first survey attempted under such conditions. The organisms (18 species) were chosen to give a wide range of behavior in the hope that a broader picture of the mechanism of toxic action might result. A summary correlation of the general results follows. At 1,000 p. p. m. the order of toxicity of gases was "fungi and bacterial— $\text{SO}_2 > \text{Cl}_2 > \text{NH}_3 > \text{H}_2\text{S}$, HCN; seeds and sclerotia— $\text{SO}_2 > \text{Cl}_2$, NH_3 , HCN, H_2S ; green leaves— $\text{Cl}_2 > \text{SO}_2 > \text{NH}_3$, HCN $> \text{H}_2\text{S}$; green stems—no difference; animals—HCN $> \text{H}_2\text{S} > \text{Cl}_2 > \text{SO}_2 > \text{NH}_3$. The order of sensitivity of classes of organisms was as follows: Ammonia—leaves $>$ stems, fungi and bacteria $>$ seeds and sclerotia, animals; chlorine—leaves $>$ fungi and bacteria, stems, animals $>$ seeds and sclerotia; hydrogen cyanide—animals $>$ leaves, stems $>$ fungi and bacteria, seeds and sclerotia; hydrogen sulfide—animals $>$ leaves, stems $>$ fungi and bacteria, seeds and sclerotia; sulfur dioxide—leaves, fungi and bacteria $>$ stems, animals, seeds, and sclerotia."

Influence of ethylene on the carbohydrazase synthesis of carbohydrates [trans. title], A. I. SMIRNOV and S. I. KRAIŇEV (*Izv. Akad. Nauk S. S. S. R. (Bul. Acad. Sci. U. R. S. S.)*, Ser. Biol., 1940, No. 4, pp. 577-588, figs. 8; *Eng. abs.*, p. 588).—The synthesis by plant tissue of complex carbohydrates is reported to have been intensified under the influence of ethylene.

Formation of pigment in glumes and kernels of wheat, A. N. GUDKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 8, pp. 841-845, figs. 6).—Since plants of most widely different genetic organization can be easily separated into their respective groups and varieties on the basis of pigmentation, this character is important to physiologists and breeders. The author presents phenological data on the appearance of pigment in a number of varieties of spring and winter wheats with the technic of determination.

Consumption of their rubber by certain plants, F. P. MAZANKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 8, pp. 838-840).—From the literature and experiments on *Taraxacum megalorrhizon gymnanthium* it is concluded that latex (rubber) is a reserve nutrient for the plant rather than a waste product of its metabolism.

Spiritus vitalis [CO_2], J. W. FOSTER, S. F. CARSON, and S. RUBEN. (Univ. Calif. et al.). (*Chron. Bot.*, 6 (1941), No. 15, pp. 337-342).—A review of present knowledge on the participation of CO_2 in metabolism, especially from the standpoint of comparative biochemistry.

A simple class apparatus for the quantitative determination of oxygen evolution in the photosynthesis of *Elodea canadensis*, L. J. AUDUS (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 16, pp. 819-823, figs. 4).

On Lubimenko extracts of chlorophyll-protein, M. L. ANSON (*Science*, 33 (1941), No. 2408, pp. 186-187).—It was shown that aqueous extracts of chlorophyll-protein can be obtained from constantly and readily available plants, that these extracts can be stabilized by cold, and that the green particles in them are larger than tobacco mosaic virus particles.

Comparative transmission spectrograms of an irradiated leaf extract, F. F. FERGUSON and L. W. WEBB, JR. (Va. A. and M. Col. et al.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 210-211, fig. 1).—That light is a factor in disintegrating an alcoholic solution of leaf green was indicated by tests of such a solution maintained in darkness for 2 days. Extremely slight changes could be shown by the method.

Comparative transmission spectrograms of different concentrations of leaf extract, L. W. WEBB, JR., and F. F. FERGUSON. (Va. A. and M. Col. et al.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 425-427, figs. 3).—This continues the work on physical properties of leaf extracts (E. S. R., 84, p. 306) and is a preliminary effort to show the effects of increased dilution of an alcoholic solution of leaf green.

Rate of greening in wheat seedlings as influenced by their endosperm, A. A. ZAITZEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 5, pp. 489-491).—The tests reported point to the conclusion that substances transferred from endosperm to young seedling contribute to a more energetic accumulation of chlorophyll. Factors influencing these processes are discussed.

Relationship between storage of chlorophyll by plants and their development, A. A. ZAITZEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 849-852).—From studies of several plant species it is concluded that the conditions favoring transition from vegetative to reproductive stages and formation of sexual cells seem also to favor the synthesis and storage of chlorophyll. Where these conditions persist for some time and the formation of sexual cells continues, the leaves preserve their high chlorophyll content for long periods, but where they soon come to an end, as in cereals, the chlorophyll content of the leaves decreases after cessation of the production of sexual cells.

The effect of light intensity on the configuration of the photosynthetic mechanism, M. C. SARGENT (*Chron. Bot.*, 6 (1941), No. 15, p. 347).—A brief review.

Absorption and utilization of radioactive carbon dioxide by sunflower leaves, J. H. C. SMITH and D. B. COWIE (*Plant Physiol.*, 16 (1941), No. 2, pp. 257-271, figs. 2).—Three possible methods of CO_2 absorption were found operative, viz, solution in the sap water, reaction with soluble buffer substances, and reaction with insoluble carbonates, presumably CaCO_3 . In addition CO_2 reacts to form a noncarbonate derivative of which little is known. The CO_2 absorbed previously to illumination can be used in the photosynthetic process. It is thus evident that CO_2 absorption for photosynthetic purposes is not a part of the photochemical reaction. The newly formed photosynthate is rapidly used up in respiration, but how its rate compares with that of other organic compounds in the leaf has not been determined.

Response of seedlings to various wavebands of low intensity radiation, R. B. WITHEROW. (Ind. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 251-256, figs. 5).—Red kidney bean and pea were grown in subirrigated gravel culture in complete absence of visible and near visible radiant energy and irradiated with 500 to 100 e. per square centimeter per second of five bands of visible and infrared radiation, and seedlings of pea, corn, soybean, tomato, and cocklebur and sprouts of potato were grown in absence of radiant energy and irradiated

with 2,000 e. per square centimeter per second of far red irradiation. The details of the results presented indicate that in the absence of radiant energy the major portion of the reserve material translocated from the cotyledons remained in those parts immediately adjacent to the cotyledonary node. The longer wavelengths of the visible spectrum increased the total amount of reserves translocated from the cotyledons, and also greatly increased the proportion translocated beyond the hypocotyl and the first internode. The accelerated movement was considerably greater toward the apical parts of the stem than to the roots. It is concluded that the process is not directly related to chlorophyll synthesis, since a minimum morphological response was produced by the blue region with a strong development of chlorophyll and almost a maximum response in the far red with only a trace of chlorophyll appearing. Pea gave much the same type of response as bean with reference to total stem length, leaf expansion, and weight and translocation of material from the cotyledons. The far red had essentially the same type of effect on corn, soybean, tomato, cocklebur, and potato as it had on bean. The far red caused a disappearance of the plumular hook of the dicotyledons, a shortening of the hypocotyl where present, and increases in leaf expansion and root size. Only a trace of green color was apparent in the leaves of any of these plants under the far red.

X-ray effects on the growth and reproduction of wheat, D. J. WORT (*Plant Physiol.*, 16 (1941), No. 2, pp. 375-383, figs. 4).—Among 24-hour-old Marquis spring wheat seedlings grown from seeds 57 and 9 mo. old, irradiated by filtered X-rays of 19-228 r-units, the greatest growth rate and height were produced under 144 r-treatment, irrespective of age. The greatest fresh and dry weights of plants from the older seeds resulted from 76 r-units; of fresh seeds, from 57 r-units. X-radiation by 76-114 r-units accelerated heading and flowering in plants from old seeds as much as 3 days, but retardation of both occurred from irradiated fresh seeds. Height and weight of Fulvio winter wheat seedlings were increased considerably by all dosages used, maxima occurring at 114 r-units.

Growth and flowering of some tame and wild grasses in response to different photoperiods, H. A. ALLARD and M. W. EVANS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 4, pp. 193-228, figs. 10).—The photoperiod responses of *Poa compressa*, *P. pratensis* (three strains), *P. bulbosa*, *Dactylis glomerata*, *Muhlenbergia mexicana*, *M. schreberi*, *Phalaris arundinacea*, *Bromus inermis*, *Phleum pratense* (five strains), *Agrostis palustris* (two strains), *Sorghastrum nutans*, *Hystrix patula*, and *Tripsacum dactyloides* were studied at Arlington, Va., using day lengths ranging from 10 to 16 and 18 hr. Most of the grasses exhibited marked responses but *M. mexicana* was less affected. The majority had long-day requirements, notably the five strains of *P. pratense*, and more especially the strains Harpenden, Russian (Moscow), and Welsh strain S. 50 originating in high European latitudes, which appear to be diploid types with 14 somatic (2n) chromosomes. The relationship of geographic range with the length-of-day requirements is noted.

Temperature and length of day have marked influence on crops (Wisconsin Sta. Bul. 451 (1941), pp. 71-74, figs. 4).—A report of progress on studies by R. H. Roberts and B. E. Struckmeyer, with particular reference to the practical findings relative to various crop plants.

Effects of periods of warm weather upon the winter hardened condition of a plant, S. T. DEXTER. (Mich. State Col.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 181-188).—In the study described, even after exposure for a week to greenhouse conditions in no case was field-grown winter wheat severely

injured by frosts when again exposed out-of-doors. This would indicate that rehardening after vernalization is possible, but that rehardening is more likely in unvernized plants. When a plant has been vernalized, the tendency toward development and elongation of the stalk is emphasized. As previously shown, any such tendency is distinctly unfavorable for hardening in the first place (E. S. R., 70, p. 167) or for retention of the hardened condition (E. S. R., 69, p. 638), and, as it now appears, is also unfavorable for rehardening. The emphasis added by this study is that, whereas rehardening is not rendered impossible by vernalization, it is made less probable. If development of the wheat plant reaches the stage of elongation of the stalk, the possibility of hardening sufficiently to withstand ordinary winter temperatures is probably gone. In alfalfa, rehardening appears to follow alternate exposure to cold, warm, and cold weather, if growth has not occurred to any great extent. Again, it appears doubtful if, without photosynthesis, full rehardening can be accomplished, since each dehardening appears to permit hardening to a lesser degree. "The general proposition may be stated that hardening of plants is favored by conditions which tend toward the accumulation or conservation of carbohydrates and other reserve foods; that is, which further photosynthesis and lessen respiration and extension of vegetative parts."

A new device for measuring leaf temperature, A. P. VOLODIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 5, pp. 487-489, figs. 3*).—The novelty in the technic described concerns the form of thermocouple used and the method of introducing it into the leaf.

Effect of high and low temperature upon chiasma formation in *Allium cepa* L., T. F. POLIAKOVA (*Comp. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 6, pp. 594-597, figs. 2*).—The character of dependence of chiasma formation on temperature in onion was found to be expressed by a bimodal curve similar to that obtained for insects. From this resemblance it is assumed that temperature exerts a direct influence on the physicochemical properties of the chromatids, and that these are evidently similar in plants and animals.

Cytology, D. M. WELLER (*Hawaii. Sugar Planters' Assoc. Ptd. Rpts., 60 (1940), Hapt. Sta. Com. Rpt., pp. 37-39*).—A progress report of studies on the effect of colchicine treatments on sugarcane.

Cotyledon numbers in conifers, D. BUTTS and J. T. BUCHHEIZ. (Univ. Ill., *Ill. State Acad. Sci. Trans., 33 (1940), No. 2, pp. 58-62*).

Formation of vegetative and generative organs in wheat and rye under conditions of slow development, G. V. ZABLUDN' (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 26 (1940), No. 9, pp. 957-960, figs. 3*).—If development is slowed down during early periods in the life of the plant, the phases of leaf and spikelet formation are also eventually lengthened, attended by increased elongation of growing cones and stems. The greater the length of the growing cones at the time spikelet tubercles are forming, the greater will be the number of spikelets per spike. Testing of cereal varieties for potential ability to form maximum numbers of spikelets is important both theoretically and from the standpoint of breeding.

On some structural peculiarities of the glumes and the paleae in wheat, V. G. ALEXANDROV and O. G. ALEXANDROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 5, pp. 492-495, figs. 6*).

Distribution and structure of the assimilatory tissue in the spike of wheat, V. G. ALEXANDROV and O. G. ALEXANDROVA (*Comp. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 5, pp. 496-499, figs. 8*).

Investigation of the viability of pollen of *Humulus lupulus* (hops) and related species germinated on artificial substrates [trans. title], I. N. HOLUB-

INSKY and M. I. RYBATSCHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 27 (1940), No. 8, pp. 846-848).

Seed germination and seedling anatomy of snapdragon (*Antirrhinum majus* L.), E. F. WOODCOCK. (*Mich. State Col.*). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 26 (1940), pp. 99-102, pls. 2).

The morphology, cytology, and sexuality of the homothallic *Rhizopus sexualis* (Smith) Callen, E. O. CALLEN (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 16, pp. 791-818, figs. 40). Studies on *R. sexualis* n. comb. (= *Mucor sexualis*).

Plasmodesmata, A. D. J. MEEUSE (*Bot. Rev.*, 7 (1941), No. 5, pp. 249-262).—In this comprehensive review (80 references) on plasmodesmata, the author considers methods for demonstrating the presence of these connecting threads of protoplasm passing through the cell walls, their nomenclature and distribution, confusion with other structures or with artifacts, and with their composition, morphology, protoplasmic nature, development, and role.

Contributions to the study of the cell wall.—III, The fibre-bonding materials and their importance in pulping, H. E. DADSWELL and D. J. ELLIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 290-298).—In continuation,* the studies here reported indicate fairly definitely that both lignin and another material are concerned in the bonding together of the wood fibers in *Eucalyptus regnans*. Both materials must be removed before the fibers will separate, the removal of either one alone not being sufficient.

An attempt to isolate the fibre-bonding material from the holocellulose of *E. regnans* F. v. M., A. W. MACKNEY (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 299-304).—A preliminary attempt to fractionate the holocellulose in eucalyptus indicated it to contain 2.8 percent of a non-furfural-yielding fraction. This is believed to be the nonlignin, fiber-bonding material.

Histological sectioning of hard tissues by a new technique, A. RANDALL, IV, and A. W. C. MENZIES (*Science*, 93 (1941), No. 2408, pp. 189-190).—Since fluid methacrylates can be polymerized in situ, it was found possible by this technic here described to embed various hard tissues in a solid medium firm enough to allow grinding of very thin sections, using the well-known methods of petrography.

Notes on the technique of tree-ring analysis, II, A. E. DOUGLASS. (*Univ. Ariz.*). (*Tree-Ring Bul.*, 7 (1941), No. 4, pp. 28-34, figs. 12).—See also a previous note (*E. S. R.*, 84, p. 454).

Properties and achievements of the universal electronic microscope, M. VON ARDENNE (*Res. and Prog.*, 7 (1941), No. 1, pp. 13-17, figs. 3).

The use of plastic as a substitute for cover glasses, V. SUNTZEFF and I. SMITH (*Science*, 93 (1941), No. 2407, pp. 157-158).

New paraffin-resin infiltrating and imbedding media for microtechnique, R. A. GROAT. (*Univ. Wis.*). (*Science*, 93 (1941), No. 2413, pp. 311-312).

Determination of stomatal condition by means of celloidin impressions [trans. title], H. WENZL (*Chron. Bot.*, 6 (1941), No. 11, pp. 250-251).—A summary of detailed investigations previously published.⁶

The maintenance of aerobic, micro-aerophilic, and anaerobic conditions in a Petri dish, A. CANTOR (*Jour. Bact.*, 41 (1941), No. 2, pp. 155-170, pl. 1).

The photoelectric determination of indole in bacterial cultures, A. R. STANLEY and R. S. SPRAY. (*W. Va. Univ.*). (*Jour. Bact.*, 41 (1941), No. 2, pp. 251-257, figs. 4).—The method presented is believed to be as accurate as and more simple than any previously reported.

* *Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 129-137.

⁶ *Jahrb. Wiss. Bot.*, 88 (1939), No. 1, pp. 89-122, figs. 14; pp. 123-140, figs. 7.

A quantitative study of environmental factors involved in survival and death of bacteria in the desiccated state, G. HELLER (*Jour. Bact.*, 41 (1941), No. 2, pp. 109-126, figs. 5).

The nutrition of *Staphylococcus aureus*: The influence of biotin, bios II_B, and vitamin H on the growth of several strains, J. R. PORTER and M. J. PELCZAR, JR. (*Jour. Bact.*, 41 (1941), No. 2, pp. 173-192, figs. 2).

The synthesis of riboflavin by staphylococci, D. J. O'KANE (Cornell Univ.). (*Jour. Bact.*, 41 (1941), No. 4, pp. 441-446).

The utilization of certain hydrocarbons by microorganisms, L. D. BUSHNELL and H. F. HAAS. (Kans. Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 5, pp. 653-673, figs. 4).—Cultures of micro-organisms capable of utilizing petroleum fractions were isolated from various places, oil-bearing soil, sedimentation ponds, and "water bottoms" of various petroleum storage tanks proving to be good but not the only sources. Many of the cultures were able to withstand as many as 10-15 transfers under kerosene without diminution in growth, thus indicating that accessory growth factors are not needed or that the organisms are able to synthesize them. The hydrocarbons were oxidized to CO₂ and H₂O. No direct correlation between respiratory quotient and nature of hydrocarbon was observed. The physiological studies described in detail are believed to establish the fact that bacterial utilization of hydrocarbons is a characteristic common to many types of micro-organisms, and that in nature this process probably occurs to a greater extent than is generally recognized and in very simple media, ordinary well water at the bottom of a distillate tank having been found capable of supporting a bacterial count of 900,000 organisms per cubic centimeter. It was indicated that oxidation of hydrocarbons is very similar to that of other organic compounds and that such end products as CO₂, H₂O, organic acids, and unsaturated hydrocarbons are produced.

The anaerobic dissimilation of citric acid by cell suspensions of *Streptococcus paracitrovorus*, H. D. SLADE and C. H. WERKMAN. (Iowa Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 5, pp. 675-684, fig. 1).—It was found that cells grown in presence of citrate plus lactose were, when suspended in a N-free medium, able to ferment citrate, oxaloacetate, and pyruvate. The steps in the dissimilation are presented. Sodium azide, sodium arsenite, and iodoacetate effectively inhibited the fermentation of citric, oxaloacetic, and pyruvic acids, sodium fluoride produced a slight inhibition, and sodium pyrophosphate had no effect.

GENETICS

Each after his kind, L. J. COLE. (Univ. Wis.). (*Science*, 93 (1941), Nos. 2413, pp. 289-293; 2414, pp. 316-319).—An appeal for mutual understanding among zoologists of the problems of the taxonomists and the need for standard classification in nomenclature, even though this may have to be modified in later years to take account of new findings and forms discovered, is given in the address of the retiring vice president of the section for the zoological sciences of the American Association for the Advancement of Science.

The cell and protoplasm, edited by F. R. MORTON (Lancaster, Pa.: Science Press, 1940, pp. [5]+205, figs. [53]).—A symposium includes papers by leading authorities on various phases of biology and genetics, some of those on botany being noted on page 453.

The course of evolution by differentiation or divergent mutation rather than by selection, J. C. WILLIS (Cambridge, Eng.: Univ. Press; New York: Macmillan Co., 1940, pp. VIII+207, figs. 10).—This is mainly a discussion of basic principles of plant evolution and adaptation in the light of modern research.

Different types of polyploidy [trans. title], F. FAGERLIND (*Chron. Bot.*, 6 (1941), No. 11, pp. 251-252).—A brief review.

Doubling of chromosomes in coffee, cotton, and tobacco induced by colchicine [trans. title], A. J. T. MENDES (*An. Prim. Reun. Sul-Amer. Bot.*, 3 (1938), pp. 331-349, pls. 7; *Eng. abs.*, pp. 346-347).—A preliminary account of studies establishing methods for treating hybrid seeds from which fertile plants may be obtained by doubling of the chromosomes.

Tetraploid six-rowed barleys obtained by colchicine treatment, G. D. KARPECHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 1, pp. 47-50, figs. 2).

The origin of Indian corn and its relatives, P. C. MANGELSDORF and R. G. REEVES. (Tex. Expt. Sta.). (*Chron. Bot.*, 6 (1940), No. 3, pp. 57-58).—A brief summary of the findings previously referred to (*E. S. R.*, 82, p. 177).

Chromosome morphology in maize and its relatives, A. E. LONGLEY. (U. S. D. A.). (*Bot. Rev.*, 7 (1941), No. 5, pp. 263-289, figs. 3).—This comprehensive review (45 references) considers the morphological features of mid-prophase chromosomes of corn and related plants, the effects relating to certain morphological features of their chromosomes, and suggestions resulting from such morphological studies.

Inheritance of chlorophyll in F_1 crosses made reciprocally between selfed lines of corn, E. S. MILLER and I. J. JOHNSON. (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 26-28).—Maternal inheritance of chlorophylls as measured by a series of crosses made reciprocally between high and low chlorophyll inbred lines of corn was not significant. Male and female parents each contributed equally to the genotype of the F_1 cross in respect to chlorophyll concentration.

Restitution of fertility in a wheat-rye hybrid through colchicine treatment, N. K. NAVALIKHINA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 6, pp. 587-589).

Inheritance of resistance to stem rust in crosses with Kenya varieties of *Triticum vulgare* Vill., I. A. WATSON (*Phytopathology*, 31 (1941), No. 6, pp. 558-560).—In crosses involving two resistant varieties of wheat from Kenya Colony and two susceptible Australian varieties (Federation 107 and Dundee 985), it was found that in each resistant variety the same gene appeared to govern the resistance of seedlings to single races of *Puccinia graminis tritici* and of mature plants to a collection of races. However, the genes for rust resistance in the two varieties were not allels and were inherited independently in a cross between the two resistant parents.

On the problem of the origin of *Nicotiana rustica*, S. A. EGHIS (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 9, pp. 952-956, figs. 4).—It is concluded from this study that the amphidiploid *N. paniculata* \times *N. undulata* (*N. rustica synihetica*), in all respects closely resembling *N. rustica scabra*, must be very close to it phylogenetically. The presence in Peru and neighboring countries of a diversity of closely related species of the *rustica* group presupposes that *N. rustica* arose polyphyletically. Since *N. rustica* forms may be cross-pollinated by insects, it appears probable that in this group amphidiploids of different origin might have intercrossed and that their hybrids, arising in different countries, should have been classified as varieties *brasilia*, *tecana*, and *humilis*, whereas *scabra* remained in a wild state.

A cytological survey of the reciprocal hybrids of the potato (*Solanum antipovicii* Buk. \times *S. tuberosum*) $\times \times$ *S. tuberosum* L., V. I. IVANOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 27 (1940), No. 1, pp. 51-54, figs. 3).

Production of tetraploid plants in triploid potato species, group Andigena, by cultivating in The Pamirs, R. L. PLELOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 1, pp. 55-58*).—The work was done on *Solanum tenuiflamentum*, *S. mamilliferum*, and *S. cuenacanum*, which proved to be sterile under the lowland conditions of the Union of Soviet Socialist Republics, but became fertile in The Pamir Mountains at 2,320 ft. elevation. The genetic differences and phylogenetic relationships are discussed.

X-ray studies on the field bean, C. F. GENTER and H. M. BROWN. (*Mich. Expt. Sta.*). (*Jour. Hered., 32 (1941), No. 1, pp. 39-44, figs. 2*).—Lots of dormant and germinated Michelite (E. S. R., 80, p. 335) white bean seeds were X-rayed with the dosages 2,160, 6,500, 13,000, and 26,000 r-units. Effects of irradiation upon the treated generation varied directly with the dosage and with the length of germination period prior to treatment as measured by the number of seeds that failed to break ground, number of seedlings that died within 19 days after planting, and retardation of growth and development of the plants. Ninety percent of the 32 types of mutations observed in the second generation were distinguishable within 5 weeks after emergence, and of these 67 percent were chlorophyll abnormalities. Other characters affected were plant size, branching, leaf size, shape and texture, fertility, and earliness of maturity. The mutation rate varied roughly with dosage and length of germination period before treatment and tended to increase with the later harvest dates and with size of progeny. The great variability in the mutant ratios indicated that the X-rays produced sectorial variations in treated plants rather than affecting the entire plant.

Chromosome morphology in *Helianthus annuus* L., L. V. KLIMOCKINA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 6, pp. 584-586, figs. 2*).—The chromosomes of sunflower species and subspecies are compared.

An artificial hybrid between two species of bluegrass, Canada bluegrass (*Poa compressa* L.) and Kentucky bluegrass (*P. pratensis* L.), W. H. BRITTINGHAM. (*U. S. D. A. coop. Univ. Md. et al.*). (*Jour. Hered., 32 (1941), No. 2, pp. 57-63, figs. 4*).—Canada bluegrass \times Kentucky bluegrass, a hybrid made in a greenhouse at State College, Pa., is not as stemmy as either parent and has dark-green leaves intermediate in length and width. First-year observations indicated good vigor and good spreading qualities. The hybrid produces fewer panicles but they are larger and heavier, and seed is produced well both under bag and with open pollination. In several quantitative characters the hybrid is intermediate and in others exceeds both parents. The data indicate that this hybrid resulted from the union of an unreduced cell of *P. compressa* and an approximately reduced pollen grain of *P. pratensis*.

A study of polysomaty in *Cucumis melo*, C. D. ERVIN. (*Univ. Wis.*). (*Amer. Jour. Bot., 28 (1941), No. 2, pp. 113-124, figs. 23*).—Polysomaty was found to be of regular occurrence in the perilem of primary and secondary root tips and stem tips of the Honey Dew, Honey Rock, Hearts of Gold, and Bender Surprise muskmelons. The origin of polysomaty is believed to lie in a chromosomal duplication in the resting nuclei which contain chromocenters that may undergo division which is not followed by spindle formation, the disappearance of the membrane, and the subsequent separation of the daughter chromosomes.

Acenaphthene-induced tetraploidy in muskmelons, D. N. ARENKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 9, pp. 1023-1029, figs. 2*).

On genotypic differences between races of *Rubus caesius* L., M. A. ROZANOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 6, pp. 590-593, figs. 6*).

Tetraploidy in tea (*Thea sinensis* L.), A. S. KASPARYAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940) No. 9, pp. 1017-1019, figs. 4*),

Chromosome counts in Quercus, J. W. DUFFIELD. (U. S. D. A.). (*Amer. Jour. Bot., 27 (1940), No. 9, pp. 787-788*).—The somatic number for 19 species was determined as 24. Some suggestions that the basic number is 6 are discussed. All evidence at hand still supports the claim that *Quercus* is a homoploid genus.

Interspecific mixtures in the Dictyosteliaceae, K. B. RAPEE and C. THOM. (U. S. D. A.). (*Amer. Jour. Bot., 28 (1941), No. 1, pp. 69-78, figs. 6*).

Embryos and ancestors, G. R. DE BLER (*Oxford: Univ. Press, 1940, pp. I+108, [pls. 2], figs. [15]*).—A discussion of the relation of characters appearing in the young and adult stages and transference between them in the lower and higher forms of animals, including their relation to evolution.

[Investigations in animal genetics by the Alabama Station] (*Alabama Sta. Rpt. 1939, pp. 20-24, 29-30*).—Brief reports of progress by J. C. Grimes and P. D. Sturkie are presented on the study of transmission of factors related to economical production of swine in three generations and the inheritance of resistance to fowl paralysis from 1935 to 1938.

Physiological approach to the evaluation of the productivity of farm animals, V. I. PATRUSHEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 27 (1940), No. 5, pp. 484-486, figs. 2*).—Based on studies of the glutathione content of the blood of several breeds of cattle at different ages, in conjunction with previous studies on other animals (E. S. R., 80, p. 471), it appears that the simplest and most effective method of determining precocity is by an analysis of the general conformation of the animal. Variations in the glutathione concentration were related to growth and condition.

Zebu (Brahman) cross cattle and their possibilities in North Australia: Co-operative investigations in Queensland, R. B. KELLEY (*Austral. Council Sci. and Indus. Res. Prog. Rpt., 4 [1940], pp. [2]+23, pls. 26, fig. 1*).—A report bringing results of crossbreeding of Brahman (Zebu) cattle with domestic beef breeds up to date is presented in continuation of previous investigations^{*} noted in part (E. S. R., 78, p. 378). Brahman bulls were mated with cows of the Hereford, Shorthorn, Aberdeen Angus, Red Polled Devon, and Jersey breeds for the production of beef. The color and horn characters were much like the British breeds, including the white face of the Hereford. The breed of Brahman affected the appearance of the hybrid, Guzaret crossbreds being preferred, though not as light in bone as those sired by the Nellore and Gir bulls. Brahman hybrids were more hardy and longer lived than the British purebreds and were found to browse upon trees and shrubs to a much greater extent than the British cattle. The hybrids were also less liable to lose weight in the winter dry season after being held over than the British breeds and showed a much greater tolerance to ticks, which was associated with the percentage of Brahman blood carried. Animals with 75 and 50 percent of Brahman blood were essentially immune, and those with 37.5 percent seldom showed tick-worry; but the progeny of animals with 19 percent of Brahman blood showed little more resistance than British-bred cattle. Based on a study of a total of 91 Brahman crosses slaughtered from 1938 to 1940, no criticism was found of the quality of the carcasses, and the hybrids graded mostly first on foot and were satisfactorily rounded out.

Investigations on the heredity of dilution and bleaching of the coat in the genus *Cavia* [trans. title], A. PICTET in collab. with A. FERREBO (*Genetica [i's Gravenhage], 23 (1940), No. 1-3, pp. 1-122, figs. 21*).—Work dealing with

^{*} Austral. Council Sci. and Indus. Res. Prog. Rpt., 3 [1938], pp. [2]+30, pls. 15.

the factors concerned with white and bleaching of the coat of guinea pigs of the species *C. Cobaya* and *C. aperea* and crosses between them indicated the operation of a recessive gene for dilution. However, in the species cross the dilution and normal conditions on the back and belly segregated into four phenotypes—nondilution on the back and belly : back diluted and belly nondiluted : belly diluted and back nondiluted : back and belly diluted (9 : 3 : 3 : 1). This suggests the action of two pairs of alleles. A character of the *aperea* species for depigmentation of the base of the hair seemed to behave the same as the *c* gene (for albinism) in the *cobaya* species. A mutation to white belly appeared in the albino line carrying the agouti gene. The white belly factor was dominant to normal color on the belly. Concerning the Himalayan pattern, localization factors were hypothesized which behaved differently in certain areas, depending on the other factors present. There were apparently two different types of bleaching of the belly. In one type the entire area was uniformly white, but in the other the belly was spotted. In neither case did the white extend to the tail or the feet. The gene *V* caused bleaching of the belly, and *D* caused bleaching of the back. Silvering on the back was variable because of the unstable mixture of white hairs and on account of spotting. Among the progeny of *VrDd* parents, young with white bellies (recessive) and white backs (dominant) did not appear, suggesting the lethal effect of the combination of these genes. Further studies with crosses of silvers and normals, silvers and silvers, and normals and silvers bore this out and showed that size of litters giving the genotype *vrD* were reduced. Differences in body size and form seemed controlled by another pair of factors, *M* for large body and *P* for small ears. A new recessive type of guinea pig with a fusiform body and small ears segregated from the hybrids. Concerning the base of the hair pigmentation, two possible explanations were offered.

Inheritance of black coat colour in the common hamster (*Cricetus cricetus* L.), S. GERSEHNSON and V. V. POLEVOI (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 8-9, pp. 608-609*).—Observation of 694 hamsters led to the conclusion that black behaved as a dominant to brown. Similar conditions in other rodents were governed by the extension gene *E^D*.

Skeletal abnormalities in the offspring of rats reared on deficient diets, J. WARKANY and R. C. NELSON (*Anat. Rec., 79 (1941), No. 1, pp. 83-100, pls. 4, figs. 3*).—Abnormalities involving shortening or absence of the long bones and various deformities and fusion of the ribs were produced in 115 of the 309 progeny of ♀ rats kept on a deficient ration. Only one such abnormality occurred among 417 progeny of ♀s receiving the same diet supplemented with dried pig liver. One abnormal offspring also occurred among 331 young produced by dams on the stock diet.

The effect of delayed fertilization on the development of the rat ovum, R. J. BLANDAUI and E. S. JORDAN (*Amer. Jour. Anat., 68 (1941), No. 2, pp. 275-291, pls. 2*).—As the interval between ovulation, estimated at 10 hr. after heat (E. S. R., 82, p. 172), and fertilization was prolonged, there was a progressive decrease in the proportion of pregnancies, normal young, and litter sizes. These findings were based on studies of 444 ♀ rats divided into groups and artificially inseminated prior to ovulation and at 6, 10, 12, 18, or 20 hr. thereafter. There were no normal young produced from inseminations more than 10 hr. after ovulation. The average litter size of normal pregnancies in the control group decreased from 6.7 to 4.6 for inseminations 6 hr. after ovulation and to 1.8 for inseminations delayed 10 hr. Resorption instead of abortion seemed to be the manner of removal of abnormal, fertilized ova.

Empirical formulae for the measurements of the central nervous system and of the digestive system in the adult cat, H. B. LATIMER (*Growth*, 4 (1940), No. 3, pp. 267-276, figs. 2).—Empirical formulas are presented for the determination of the weights and linear measurements of the brain and digestive system and the major divisions of each in ♂ and ♀ cats. The results were based on 104 adults equally divided as to sex.

The prenatal growth of the cat, IX, X, H. B. LATIMER (*Growth*, 3 (1939), No. 4, pp. 337-346, figs. 4; 4 (1940), No. 3, pp. 259-265, fig. 1).—Two papers are presented in continuation of this series (E. S. R., 83, p. 47).

IX. The ponderal growth of the hypophysis, thyroid, thymus, and suprarenal glands.—Empirical formulas are suggested for plotting the pituitary, thyroid, thymus, and suprarenal weights according to body weights and lengths of fetal and adult cats.

X. The weight of the spleen in the fetal period and in the adult.—In this study formulas were derived for spleen weights of ♂ and ♀ fetal and adult cats based on body weight and body length. Spleen weight was significantly correlated with body weight in each sex and with testis weight. Correlations with other endocrine weights were positive but not significant.

The proposed breeding program of the Regional Poultry Research Laboratory, N. F. WATERS and J. H. BYWATERS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 221-223).—The initial work of the laboratory has consisted in the development of families and testing the progeny of 70 ♀s for viability and vigor, with and without inoculation for fowl paralysis. There are considered, in the selection of the families, fertility, hatchability, and egg production, in addition to resistance to disease.

[Experiments in inheritance in poultry by the Western Washington Station] (*Western Washington Sta. Rpt.* 1940, pp. 42-44, 49-50).—Brief results are presented by G. E. Bearse, C. F. McClary, and C. M. Hamilton of progress on the increase of viability in strains and the relation of leucosis susceptibility to the occurrence of iritis, and the inheritance of slow feathering and eggshell quality in White Leghorns.

Transmitting ability in males of genes for egg size, F. A. HAYS. (Mass. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 217-220).—Data on the weights of eggs produced in March by 1,671 daughters of 116 sires and 342 dams showed that egg weight was inherited but that it was not sex-linked. The data are considered to support the ABC hypothesis (E. S. R., 78, p. 470), the birds being classified in three phenotypes for egg size.

The efficiency of feed utilization by Barred Plymouth Rock and crossbred broilers, C. W. HESS, T. C. BYERLY, and M. A. JULL. (Md. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 210-216, figs. 2).—Data on the efficiency of feed utilization of purebred and crossbred progeny of eight sires of the Barred Plymouth Rock and New Hampshire breeds showed that the crossbred progeny generally excelled the purebreds in efficiency of feed utilization, which was calculated from the formula $E=C-kW$, used by Titus (E. S. R., 60, p. 567). The C values represented the theoretical growth efficiency. C ranged from 0.252 for purebred Plymouth Rock progeny of one sire to 0.439 for hybrid progeny of the same sire. The purebred and crossbred progeny of two of the sires were almost identical in feed efficiency, but there were differences of 21.1 and 37.4 percent, respectively, between the most efficient and the least efficient purebred Rock and crossbred progeny of the ♂ lines. It seems evident that efficiency of feed utilization is inherited.

Progeny-testing in the breeding of pigeons, C. S. PLATT. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941) No. 3, pp. 232-233).—Because of the mating

of ♂ pigeons with more than one ♀ and the abnormal behavior of single confined pairs to insure the production of young stock of known pedigrees, a method was devised of placing several full brothers in a mating pen with several full sisters from a different parent stock. The coefficient of variation of the weight of squabs produced by five pairs handled in this manner was only 12.2 percent, as compared with 27.5 percent in the progeny of 138 unselected pairs. This method also provides possibilities of a progeny-testing program for pigeons.

Physiology of development of the feather.—V, Experimental morphogenesis, F. R. LILLIE and H. WANG (*Physiol. Zool.*, 14 (1941), No. 2, pp. 103-135, pls. 8, figs. 5).—Continuing this series (E. S. R., 83, p. 331), feathers of the breast and saddle tracts of White and Brown Leghorns served for study of the effect of operations on the papillae, principally of regenerating feathers. Transplantation experiments proved that papillae preserve an innate bilateral organization in any orientation, even outside their own tracts. Approximately normal feathers could develop from a portion of the papillae after the removal of the other portion. Chimera feathers developed from fusing contralateral halves from breast and saddle papillae. Operated papillae continued to produce the same type of abnormal feathers in successive generations.

Partial doubling of both wings in a Ring-neck pheasant, T. H. BISSEXNETTE (*Jour. Hered.*, 32 (1941), No. 4, pp. 139-144, figs. 3).—A full-grown cock pheasant possessing supernumerary wings on both sides is described and illustrated. The supernumerary wings resembled epaulettes attached to the shoulders. In a large breeding pen in which this was 1 of 30 ♂s, no progeny exhibited the condition nor was it ever observed in other individuals. The osteology was brought out after clearing the appendage by the potassium-hydroxide-alizarin-red S technic.

Experiments on the physiology of egg white secretion, B. R. BUEMESTER and L. E. CARD. (Univ. Ill.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 224-226).—Utilizing methods of ligating the oviducts of fowls previously reported (E. S. R., 54, p. 660), the authors found that only 8 yolkless and no normal eggs were laid during a 16-week period. The reactions of the operated hens were of interest in that the 36 birds that lived were trap-nested an average of 7.9 times per week without laying. Evidently, the stimulus to nesting is some function other than the passage through or the presence of an egg in the oviduct.

Changes in the skeletal tissues of mice following the administration of thyroxin, M. and R. SILBERBERG (*Growth*, 4 (1940), No. 3, pp. 305-314, figs. 6).—Histological study of the bones of mice which had received treatment with thyroxine for from 2 weeks to 14 mo. showed that the hormone first accelerates proliferation, then ossification, and finally resorption of the epiphyseal cartilage of the joints.

The artificial insemination of chickens, F. P. JEFFREY (*New Jersey Stat. Hints to Poultrymen*, 28 (1940-41), No. 2, pp. [4], figs. 2).—A description of the method is given.

Viability of spermatozoa of the chicken under various environmental conditions, C. S. SHAFFNER, E. W. HENDERSON, and C. G. CARD. (Mich. State Col.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 259-265, figs. 4).—Although approximately 30 percent of the spermatozoa in chick semen dehydrated by the addition of levulose and quick-frozen to -76° C. were motile when thawed at from 42° to 45° after 52 days, no fertile eggs were produced in artificial insemination tests. However, semen quick-frozen at -6° and thawed after 30 sec. produced a live chick in such tests. The length of life of sperm preserved in the unfrozen condition was inversely proportional to the storage temperature, the most fav-

orable being from 0° to 1°. Tests below freezing showed that -76° was the only temperature at which viability persisted longer than a few hours. These samples were stored between cakes of dry ice. Dehydration of the semen with 0.12 gm. of levulose per gram of semen and freezing between flat surfaces of dry ice gave as satisfactory results as other methods, but approximately 65-75 percent of the sperm were killed or immobilized. Sucrose and levulose with and without physiological salt solution were used for diluents.

The effect of certain inhibitors and activators on sperm metabolism, H. A. LARDY and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour Biol. Chem.*, 138 (1941), No. 1, pp. 195-202).—Study of the effects of inhibitors on motility of bull sperm in the yolk-buffer pabulum previously described (E. S. R., 83, p. 615) demonstrated that low concentrations of iodoacetic acid which inhibited the break-down of glucose to lactic acid did not affect motility. Similar results were obtained with 0.01 M solutions of selenate, arsenate, and malonate and 0.001 M of cyanide. The results indicate that a process other than oxidation or glycolysis furnishes the energy for motility, since blocking both processes still permitted retention of motility by the sperm for a considerable time.

The influence of sex hormones, especially dehydroandrosterone, on the gonad development of chick embryos [trans. title], G. J. VAN OORDT and G. L. RINKEL (*Arch. Entwickl. Mech. Organ.*, 140 (1940), No. 1, pp. 59-80, figs. 16).—Injection of a single dose of 1,000 International Units of oestrone into the egg after 5 days' incubation had a feminizing influence on ♂ embryos. The left gonad changed into an ovotestis with a pronounced ♀ cortex, but the right testis was unchanged. In ♀ embryos, oestrone had no influence. Doses of 1.5 mg. of dehydroandrosterone did not affect ♂ or ♀ embryos except that there were pathological changes in the Wolffian duct of embryos of both sexes. The study was conducted by injecting eggs of the partridge-colored Leghorn × Sussex ♀s. The ♂s were yellowish white, and the ♀s had brown down at hatching.

Proliferation and ovogenesis in the germinal epithelium of the normal mature guinea pig ovary, as shown by the colchicine technique, I. G. SCHMIDT and F. G. HOFFMAN (*Amer. Jour. Anat.*, 68 (1941), No. 2, pp. 263-273, pl. 1).—Histological study of the ovaries of mature guinea pigs which had been injected with colchicine revealed 117 mitotic figures in the germinal epithelium during the oestrous period and 57 during other times. These are compared with 9.5 in the ovaries of the controls. This was in contrast to over 1,000 mitotic figures per ovary in the mouse during oestrus found by Allen and Creadick (E. S. R., 78, p. 773). Follicles and ova were formed by direct differentiation of germinal epithelial cells which differentiated into ova and follicles.

Replacement of oocytes in the ovary of normal and hormone-injected young rats, L. MARX (*Anat. Rec.*, 79 (1941), No. 1, pp. 115-131, pls. 2).—Cytological study of the ovaries of young rats showed that after the first days of life newly formed synapses and free oocytes were rare in prepuberal animals. The ovaries of rats injected with gonadotropic preparations at ages ranging from 7 to 44 days showed signs of masculinization. Sex hormones inhibited the growth of interstitial and germinal tissue, and the ovaries were small. Male hormone produced a high degree of development of the tubules. Evidently, germinal tissue has a wide potentiality in development determined by outside influences.

The growth depressing effect of large doses of testosterone propionate in the castrate albino rat, H. S. RUBINSTEIN and M. L. SOLOMON (*Endocrinology*, 28 (1941), No. 1, pp. 112-114, fig. 1).—Growth in body weight and length from 26 to 80 days of age was depressed in castrate as well as normal rats (E. S. R.,

52, p. 324) by the daily administration of 1 mg. of testosterone propionate. The greater depression in the growth of treated castrates was considered due to the effect on the pituitary resulting from the effect of an overdose of the hormone in the castrated animals, as contrasted with the stimulation of growth from small doses (E. S. R., 85, p. 331).

Synergism of estrogens with pituitary gonadotropins in hypophysectomized rats. M. E. SIMPSON, H. M. EVANS, H. L. FRAENKEL-CONRAT, and C. H. LI (*Endocrinology*, 28 (1941), No. 1, pp. 37-41, figs. 6).—Increases in the ovarian and uterine weights of hypophysectomized ♀ rats were induced by injection or implantation of pellets of stilboestrol and Antuitrin-S. However, much more than the combined effect was induced with the simultaneous administration of stilboestrol and FSH (follicle-stimulating hormone) but not with ICSH (interstitial cell-stimulating hormone). The ovarian weights of the controls 9 days after hypophysectomy were about 10 mg., even with ICSH administration, and with stilboestrol or Antuitrin-S were more than doubled. Weights of more than 100 mg. were attained when both FSH and stilboestrol were administered, showing the synergistic effects. The large increase was brought about by the development of large follicles, thecal luteinized follicles, and corpora lutea, as well as interstitial tissue response.

Effect of gonadepinephrectomy on the structure of the anterior lobe of the hypophysis. M. L. ROSEHLYN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S. n. ser.*, 27 (1940), No. 5, pp. 504-507, fig. 1).—The removal of both gonads and adrenals in ♀ rats either prevented or delayed the formation of castration cells in the pituitary, but large numbers of degenerating basophilic cells were present. Adrenalectomy 30 days after gonadectomy delayed the formation of castration cells from basophiles. The number of eosinophiles and basophiles was reduced in relation to the other cells in the hypophysis as a result of removal of both glands.

Retardation of mammary involution in mice by injection of lactogenic hormone. C. W. HOOKER and W. L. WILLIAMS (*Endocrinology*, 28 (1941), No. 1, pp. 42-47, figs. 5).—The rate of involution of the mammary gland in ♀ mice having their young removed 4 days after parturition was definitely delayed by the daily subcutaneous injection of a lactogenic extract of anterior pituitary. The results were interpreted to indicate that mammary involution was retarded in the suckling animals by the release of lactogenic hormone as a result of nipple stimulation. The inhibition of involution resulted in the maintenance of the lobule-alveolar and duct systems for about 7 days, comparable to that of the nonsuckled ♀ 4 days after parturition.

The relation of the thyroid to mammary gland growth in the rat. S. L. LEONARD and R. P. REECE. (N. J. Expt. Stas.). (*Endocrinology*, 28 (1941), No. 1, pp. 65-69, figs. 6).—The mammary gland response of thyroidectomized normal and castrated ♀ rats to Progynon-B (oestrogen) showed that on the whole there was greater development of the lateral and end buds than in the controls. This was especially pronounced in castrated animals. Thyroxine administration tended to prevent the greater development of the mammary gland following oestrogen treatment.

A method of handling ratios by the analysis of variance. W. D. BATEN and E. W. HENDERSON. (Mich. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 227-231).—Although the usual application of the analysis of variance is not legitimate for percentages, a method of converting the percentages to angles by Fisher's transformation (E. S. R., 80, p. 604) may be employed. Examples from percentage of hatch and mortality arising in poultry experiments are presented.

FIELD CROPS

[Agronomic research in Alabama, 1939] (*Alabama Sta. Rpt. 1939*, pp. 15-16, 17-18, 19-20, 33-34, 38-39).—Field crop experiments and related work (E. S. R., 84, p. 33) are reported by H. B. Tisdale, J. B. Dick, N. J. Volk, J. T. Williamson, F. E. Bertram, J. K. Boseck, R. C. Christopher, H. A. Ponder, J. W. Richardson, R. W. Taylor, H. R. Albrecht, D. G. Sturkie, E. L. Mayton, C. L. Isbell, and J. F. Duggar on cotton breeding; variety tests with cotton and oats; the response of cotton to Mg and rare elements in south Alabama; top dressing cotton with potash; influence of soil moisture and fertilizer applications on the oil and protein content of cottonseed; effects of inoculation on yields of peanut hay and nuts; the effect of continuous and intermittent cropping of vetch on the yield of vetch and of cotton and corn following; influence of harvesting small amounts of sweetpotatoes during the period of root production on total yield; effects of scalding on germination and stands of crotalaria seed and of exposing on the soil surface on germination of untreated crotalaria seed; and height and frequency of mowing sericea.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), Nos. 3, pp. 1, 3-5, 6, 7, 8; 4, pp. 1, 2, 6, 8; 5, pp. 1, 2-6).—Brief reports of progress are made from current research in the following articles:

No. 3.—Summer Legumes Best Utilized as Feed for Livestock, by C. D. Hoover (pp. 1, 6); The Influence on Cotton Production of Nitrogen, Phosphorus, and Potassium, by J. L. Anthony and J. Pitner (pp. 3-5); Outlying Cooperative Cotton Variety Tests—Central East Delta, 1940, Southeast Yazoo-Mississippi Delta, 1940, West Delta Section, 1940, by H. A. York (pp. 6, 7); Seedbed Preparation in Fall, Winter, for Best Cotton Yields, by I. E. Hamblin (p. 7); and Varieties of Soybeans, With Successive Maturity Dates, Show Merit in Tests at State College, Raymond, and Holly Springs, by J. F. O'Kelly (p. 8).

No. 4.—Irregular Stands May Not Decrease Yields of Cotton, by J. W. Neely (pp. 1, 8); Edible Soybeans in the Yazoo-Mississippi Delta, by E. A. Currey (pp. 1, 2); Primary Purpose of Cotton Cultivation Control of Weeds, New Data Indicate Other Benefits May Affect Soil, Plant, by O. A. Leonard (p. 2); Fertilizer Tests in Central East Delta Show Nitrogen Need (p. 2), Soil Fertility Experiments With Cotton—Ladd Field—North of the Central East Delta (p. 6), and Commercial or Legume Nitrogen for Soils of Delta (p. 8), all by R. Kuykendall; and Treated Cottonseed Stored Without Damage in Cotton or Burlap Bags, Dusts Increase Emergence and Yields, by L. E. Miles (p. 8).

No. 5.—Clover Stand Valuable for Crop of Seed, by H. W. Bennett (pp. 1, 2); Seven States Test Varieties, Strains of Sweetpotatoes, by W. S. Anderson (pp. 1, 2); and Sweetpotato Plant Spacing, by W. S. Anderson, E. A. Currey, E. B. Ferris, and J. C. Robert (pp. 3-6).

[Field crops investigations in Tennessee]. (Partly coop. U. S. D. A. et al.). (*Tennessee Sta. Rpt. 1939*, pp. 5-11, 16, 17, 53-54, 55, 61, 66-71, 72-73, 74-77).—Results are reported again (E. S. R., 83, p. 481) from agronomic experiments at the station and substations by N. I. Hancock, J. K. Underwood, K. B. Sanders, J. J. Bird, B. D. Drain, K. L. Hertel, L. R. Neel, B. P. Hazlewood, and F. S. Chance, including breeding work with cotton, corn, oats, barley, sweetpotatoes, tobacco, winter peas, and pasture grasses; variety trials with cotton, corn (and comparisons of corn hybrids), wheat, oats, barley, rye, tobacco, potatoes, sweetpotatoes, soybeans, alfalfa, and clovers and grasses; a comparison of yields of wheat, barley, oats, and rye; production tests with buttonclover (*Medicago orbicularis*) and fuzzy cheat (*Bromus japonicus*); cultural, including planting, experiments with corn, rye, barley, and potatoes; fertilizer experiments with

corn, wheat, oats, potatoes, and tobacco: effects of six P carriers and previous fertilizer treatments on the yields and phosphate content of German millet and Austrian Winter peas; causes and prevention of fertilizer injury to seeds and seedlings; research on technic and devices for measuring length and fineness of cotton fiber; electricity as a source of heat for storage of sweetpotatoes; comparison of winter cover crops on cotton; tests of grazing value of sericea; a N fertilizer test on bluegrass sod; corn in rotation v. continuous cropping; rotations and air-curing tests for tobacco; and eradication of cactus.

[Field crops experiments in Washington]. (Partly coop. U. S. D. A. and Idaho Expt. Sta.). (*Washington Sta. Bul.* 394 (1940), pp. 1-20, 64-65, 86-91, 93-94, 95-98, 102, 106, 110, 111, 112-113).—Further experimentation with field crops (E. S. R., 83, p. 185) by O. E. Barbee, O. A. Vogel, E. G. Schafer, E. F. Gaines, C. Claassen, W. A. Harvey, C. Seely, E. J. Kreizinger, J. R. Swallen, D. C. Smith, C. L. Vincent, W. J. Clore, H. D. Jacquot, H. P. Singleton, C. E. Nelson, C. A. Larson, H. G. Nickle, F. L. Overley, R. F. Sackman, P. G. Lemmon, D. J. Crowley, and V. B. Hawk, reported on from the station and substations, comprised variety tests with spring and winter wheat and barley, oats, rye, corn (and hybrids), grain sorghum, potatoes, sweetpotatoes, seed flax, alfalfa, sweetclover, soybeans and edible soybeans, grasses, cover crops, and mixtures of forage crops; breeding work with barley, rye, wheat, alfalfa, sweetclover, potatoes, and crested wheatgrass and other forage grasses; studies of inheritance of resistance to smut and rusts in wheat and rye hybrids and grass hybrids; cultural (including planting) studies with wheat and alfalfa; tests of time and amount of irrigation for sugar beets and potatoes and methods of irrigation for sugar beets; tillage and soil moisture studies; fertilizer trials with alfalfa and sugar beets; crop rotations, including permanent fertility and organic matter maintenance studies; grasses for soil conservation; and control experiments with perennial sowthistle, whitetop, Russian knapweed, fern, and other perennials and weeds of cranberry bogs.

[Field crops work by the Western Washington Station]. (Partly coop. Wash. Expt. Sta., U. S. D. A., et al.). (*Western Washington Sta. Rpt.* 1949, pp. 12-13, 15-18, 56).—Progress results (E. S. R., 83, p. 185) are reported by M. S. Grunder, K. Baur, E. P. Breakey, W. A. Harvey, and A. M. Richardson on variety tests with alfalfa, corn for grain and silage, popcorn, and oats; alfalfa-orchard grass mixtures for hay; inoculation, fertilizer, and B tests with alfalfa; seedings of grasses, clovers, and flat peas on burned-over land; and control of bracken fern.

[Field crops research in Wisconsin, 1939-40]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul.* 451 (1941), pp. 5-22, 32-34, 35-39, 93-95, 96-99, figs. 12).—Experiments with field crops and related agronomic studies (E. S. R., 83, p. 333), reported briefly from the station and substations, dealt with the relative merits of bromegrass pasture, by H. L. Ahlgren and A. E. Darlow; improvement of pastures on red clay, by D. H. Holt, Ahlgren, and E. J. Delwiche; special management of pasture on sandy lands, by A. R. Albert and C. J. Kindschi; development of improved strains of nonpoison Sudan grass, by P. Hogg and Ahlgren; very palatable strains of Kentucky bluegrass, by Ahlgren; wilt-resistant lines of alfalfa, by R. A. Brink and F. R. Jones; sweetclover strains low in coumarin, root rot-resistant, and late maturing, by W. K. Smith; better foundation seed stocks of potatoes, by G. H. Rieman; variety tests with seed flax, by J. H. Torrie and A. C. Dillman, sugar beet strains, by Torrie, corn (and hybrids) for grain and silage, by Delwiche and A. M. Strommen, and potatoes, by Rieman; use of grass seeding attachments on corrugated land rollers for seeding alfalfa-timothy mixtures, with a compari-

son of nurse crops, by Ahlgren, F. W. Duffee, B. D. Leith, and Torrie; seeding tests and varietal comparisons with Vicland oats, by H. L. Shands and Leith; freezing injury to seed corn as affected by moisture content, by A. H. Wright; number of kernels per hill for corn in northern Wisconsin, by Delwiche and Strommen; fall v. spring plowing for barley, by L. B. Nelson and Albert; production and retting tests with hemp, by Wright; fertilizer experiments with barley, by Nelson and Albert, rye and potatoes, by Albert, and sugar beets, by K. C. Berger and E. Truog; cooking tests with potato varieties, by Rieman and W. El. Tottingham; comparative resistance of Houma and Katahdin potatoes to hopperburn, by T. C. Allen, Rieman, and J. S. McFarlane; use of binder tobacco with intermediate burn in making good cigars, by J. Johnson; injury to tobacco seedbeds by cyanamide when used to control weeds, by W. B. Ogden; and control of weeds in small grain with Sincox (E. S. R., 83, p. 55), by A. Schwendiman, Torrie, C. C. Gilman, J. N. Kavanaugh, G. W. Tycan, J. F. Magnus, and R. C. Swanson.

[Range and pasture research in Nevada]. (Partly coop. U. S. D. A.). (*Nevada Sta. Rpt. 1940*, pp. 22-27, figs. 3).—Brief reports are made on range carrying capacity estimates and the development of a rotation paddock system of grazing on irrigated meadows by range flocks of sheep, both by C. E. Fleming and C. A. Brennen; annual bromegrasses as invaders of sheep and cattle ranges, by Fleming; and control of whitetop and other weeds by competition with reed canary grass and other grasses and legumes, by Fleming, Brennen, and F. B. Headley.

Permanent pasture studies, M. Nelson (*Arkansas Sta. Bul. 407 (1941)*, pp. 58, figs. 8).—Further report (E. S. R., 71, p. 763) is made on pasture experiments, 1930-39, at the Cotton, Rice, and Fruit and Truck Substations.

Bermuda grass continued to be the most dependable pasture base at each location, and Dallis grass was the most important grass supplement to Bermuda. The winter legumes, hop clover, white clover, and bur-clover, produced best results, while lespedeza, especially common lespedeza, because of its better volunteering habit, was the most satisfactory summer legume.

Superphosphate alone was effective and profitable and apparently sufficed for new pastures, although legumes, as well as the main pasture base, were needed for best results from superphosphate. A complete fertilizer under reasonably favorable conditions barely returned its cost, while application of N only appeared to be a doubtful practice. Pasture development on depleted soil, supplemented by economical use of phosphates and lime, has yielded immediate good returns and proved to be the best method of restoring productiveness and value to exhausted and wasted land.

Measuring pasture returns by gains of grazing stock was the most satisfactory method. Annual acre gains in weight of stock on unfertilized pastures in the several locations have varied from about 225 to 350 lb. as averages for more than one season. Semimonthly weights of stock taken during the season revealed that satisfactory gains up to the end of the grazing period occur only in most favorable seasons, for maximum gains in weight may be reached in July or earlier. Supplementary pastures based largely on legumes are suggested as a practical remedy, e. g., Kobe lespedeza, when available, has proved to be an excellent substitute beginning in July. Measurements in terms of yields of hay showed that pasturage is a sizeable annual farm crop and that sustained production requires planned management. Plowing Bermuda grass pastures to improve production when returns are low was not justified by the results.

Other factors affecting returns from pasture, discussed briefly, include rainfall, age and health of stock, insect pests, renovation, burning, weed control especially by mowing, and all-year grazing.

Dry-land pasture experiments at the Judith Basin Branch Station, Moccasin, Montana, R. M. WILLIAMS and A. H. POST. (Coop. U. S. D. A.). (*Montana Sta. Bul.* 388 (1941), pp. 25, figs. 13).—Early pasture experiments begun in 1925 indicated the comparative aggressiveness and drought resistance of slender wheatgrass (*Agropyron pauciflorum*), brome grass (*Bromus inermis*), and crested wheatgrass (*A. cristatum*). After 15 yr. brome and slender wheatgrass had largely disappeared in the pastures seeded to a mixture of these three species, while good stands of crested wheatgrass remained.

A larger pasture experiment was begun in 1932 to determine the relative values of crested wheatgrass, native grass, and brome grass for dry land pastures. For the 7 yr. these pastures were grazed, annual precipitation never exceeded the long-time (1900-40) station average. 14.76 in., and only in 1938 did the seasonal (April 1-September 30) precipitation exceed the 32-yr. average, 10.58 in. Crested wheatgrass was quite similar in composition to brome grass and a composite of native grass species during the summer grazing season, but in winter forage, crested wheatgrass was lower than either in protein content. Crested wheatgrass furnished grazing about 2 to 3 weeks earlier in the spring than either native or brome grass pasture. For crested wheatgrass, brome grass, and native grass, respectively, the grazing season, 1934-40, averaged 125, 113, and 93 days long; average animal days of grazing per acre 33.1, 21.5, and 15.1; gains in animal weight (on 23.6 acres) 1,657, 1,073, and 768 lb.; and average total gains in animal weight per acre 70.2, 45.5, and 32.5 lb. The average daily gains per animal were about equal for the livestock on all three pastures. With the more favorable rainfall during the latter part of the experiment, the pasture had to be stocked at the rate of one animal to 2 acres to obtain maximum use.

Crested wheatgrass produced earlier grazing, a longer grazing season, a higher carrying capacity, and more beef per acre than native or brome grasses. Crested wheatgrass might be utilized to best advantage for early grazing in conjunction with the native species used for finishing. Brome grass has been intermediate in value to crested wheatgrass and native grass pastures.

The effects of burning pasture and woodland vegetation, H. M. ELWELL, H. A. DANIEL, and F. A. FENTON. (Coop. U. S. D. A.). (*Oklahoma Sta. Bul.* 247 (1941), pp. 14, figs. 4).—The quantity of native grass hay from a grazed pasture near Guthrie which had areas of burned and unburned land was compared with the production from other areas protected from burning and grazing, and soil and water losses were measured on scrub oak land with woodland litter unburned and burned in early spring. The results considered with findings elsewhere demonstrated that burning makes the early spring growth of grass more available and possibly more palatable to animals. This advantage, however, is more than offset by reduction in quantity and quality of forage produced over a period of years, by destruction of plant nutrients and organic matter and wildlife, by increased losses of soil and water, and by damage to fence posts and other equipment. Although tests were not made of the effects of burning upon insect life, available information on the way damaging insects hibernate and reproduce indicates that burning could have little effect upon them.

Strawberry clover shown to be valuable on wet, saline land as forage for sheep, R. M. WEIBING and I. WATSON. (Coop. U. S. D. A.). (*Colo. Farm Bul.* [*Colorado Sta.*], 3 (1941), No. 2, pp. 3-4, fig. 1).—Soil and cultural requirements of strawberry clover and its production of pasturage for sheep are

described briefly. Station results suggest seeding in early spring, as April 15, 5 lb. per acre on land plowed and worked into a good seedbed, mowing twice the first summer, keeping the soil moist the entire first season, and pasturing moderately. During the summer of 1940 strawberry clover seeded in 1938 was pastured with sheep at the rate of about 17 per acre from June 1 to September 1, and the animals averaged 5 lb. gain for the 3 mo. without other feed during this period. Pasturing could have started May 15 and continued during most of September. Feed was sufficient at all times, and more animals could have been used part of the season.

Cotton variety tests conducted at Lawton, Oklahoma, in 1940, H. E. DUNLAVY, I. M. PARBOTT, and F. W. SELF. (Coop. U. S. D. A.). (*Oklahoma Sta. Cir. 93 (1941), pp. [2]+22*).—The 14 high-yielding cottons among the 55 varieties and strains tested at the U. S. Dry Land Field Station in 1940 represented the Acala 5, Deltapine, Stoneville, Lone Star, Triumph, Rowden, and Hi Bred families or lines. These 14 varieties averaged 160 and 106 lb. more seed cotton and of seed per acre, respectively, and returned \$4.68 more per acre for lint than did the other 41 varieties. The 55 varieties produced an average of 516 lb. of seed per acre estimated to contain about the same amount of protein as 22 bu. of corn or 14 bu. of wheat. The 14 varieties averaged slightly over $1\frac{5}{16}$ in. ranging from $1\frac{3}{16}$ to 1 in. in staple length, while the other 41 varieties averaged slightly over $1\frac{3}{32}$ in. and 15 of the 41 stapled longer than 1 in. The average cost of picking and ginning a bale for the 55 varieties was \$13.55 and for pulling and ginning \$14.14. Data on these and other agronomic characters and factors are tabulated and discussed.

The distribution and relation of fiber population, length, breaking load, weight, diameter, and percentage of thin-walled fibers on the cottonseed in five varieties of American upland cotton, J. H. MOORE. (N. C. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 5, pp. 255-302, pls. 2, fig. 1*).—These factors were measured in the 1937 crop of Mexican 128, Coker-Cleveland 884-4, Farm Relief No. 1, Acala 4067, and Rowden 40 varieties of cotton (*Gossypium hirsutum*). Six regions, or punch areas, were studied on each of 10 seeds from 10 plants of each variety.

The fiber population was found densest at and near the chalazal area of the seed and to become thinner downward toward the micropylar end and outward toward the raphe. No two varieties are alike in the fiber distribution. Results from the whole experiment indicated that fibers on the basal end of the seed are lighter, thinner, weaker, and longer than those on the apical or micropylar end. Varieties significantly affect the population, diameter, and percentage of thin-walled fibers of regions. Real differences exist between varieties in the means of fiber population, length, breaking load, diameter, and percentage of thin-walled fibers.

Plants (as represented by one seed) within a variety showed differences among themselves in fiber length, unit fiber weight, fiber strength, fiber diameter, and percentage of thin-walled fibers, i. e., regional differences. Some plants are more uniform than others. In the varieties studied, variation of fiber length and diameter on the seed seemed due mostly to variability within regions, indicating that selection of plants for uniformity of length and diameter should largely be based on uniformity of the whole fiber population of the seed without special regard to regional differences. The breeder, it appears, may be able to select plants which show a relatively low amount of variation in fiber weight, fiber strength, and percentage of thin-walled fibers between

regions on the seed and thus eliminate some of the variability in these properties.

The simple correlation within varieties of density of fiber population with fiber weight per inch, with strength per fiber, and with percentage of thin-walled fibers is very significant and striking in each variety; and an increasing fiber population is thus associated with a decreasing fiber weight and fiber strength and with an increasing percentage of thin-walled fibers. Within each variety simple correlations indicated a very consistent association of fiber weight per inch with strength per fiber and also with percentage of thin-walled fibers. An increasing fiber weight was correlated with increasing fiber strength and with a decreasing percentage of thin-walled fibers. The simple correlation of strength per fiber with percentage of thin-walled fibers is very consistent and significant within each variety, where increasing fiber strength is associated with a decreasing percentage of thin-walled fibers.

Simple and partial correlations by regions for the entire experiment of density of fiber population with fiber weight per inch, with strength per fiber, and with percentage of thin-walled fibers are similar in each relationship to the simple values within varieties. For the entire experiment by regions, the total, or simple, correlation of fiber population with fiber length does not appear to be significant, while the partial value is significant and negative. There is a real negative association of fiber length with fiber weight per inch in both total and partial orders; the former fiber character shows a significant and negative simple association with strength per fiber, but the partial value is not significant; and independent of all other fiber characters, there is perhaps a positive association of fiber length with fiber diameter. Fiber weight per inch appears to be correlated with strength per fiber, with percentage of thin-walled fibers, and with fiber diameter in both simple and partial orders, i. e., as fiber weight goes up, fiber strength and diameter increase and percentage of thin-walled fibers decreases. As strength per fiber increases, percentage of thin-walled fibers goes down in both simple and partial orders; and an increase in percentage of thin-walled fibers is associated with a larger fiber diameter in the partial relationship.

Total and partial-order correlations for the complete experiment by plants, or seeds, are similar to those for the entire experiment by regions, especially as to signs; but relatively few values are significant. Density of fiber population is negatively associated with fiber length in both simple and partial orders, and a negative relationship is noted for the simple association of fiber population with fiber weight and with fiber diameter. Independent of all other fiber characters, fiber length is negatively associated with fiber weight per inch and fiber weight is positively associated with fiber diameter.

Corn varieties and hybrids and corn improvement, F. H. HULL, J. D. WARNER, and W. A. CARVER (*Florida Sta. Bul. 355 (1941), pp. 50, figs. 24*).—Yield tests with corn varieties and hybrids at the station and at Quincy, 1936-40, are reported on, with comments on results of earlier tests by the station and tests on private farms, descriptions of corns of current interest, and discussions on the characteristics of a good utility type, reproduction in corn and methods of corn improvement, and the development, commercial production, and use of hybrid seed corn in Florida.

Recommendations include the station hybrid Fla. W-1 (Florida White Hybrid No. 1) for highest yields and good weevil resistance in the northern half of Florida; Florident White, high-yielding with medium weevil resistance, for the part of the crop to be fed in fall or winter; and McIntosh and Munroe Little Cob, white corns of fair yield and good weevil resistance, for the part to

be held in crib storage without fumigation into spring and summer. Dubose and Kilgore Improved Florida Flint with lower yields but better weevil resistance than McIntosh, and Munroe Little Cob may be preferred where weevil infestations are high. Cuban Yellow Flint is indicated in all parts of the State where extreme resistance to weevil damage is desired, but otherwise it is recommended largely for southern Florida and especially for muck lands. Florident Yellow, a high-yielding corn with fair weevil resistance, probably will be used mostly in central and northwestern Florida for feeding livestock in fall and winter, and will also be satisfactory for silage on all mineral soils except in extreme southern Florida. Wood Hybrid Golden Prolific may be used in small plantings to provide feed for from 1 to 2 weeks before later types of corn are ready to feed.

Tests of hybrid corn show what varieties are adapted to various Colorado conditions, W. H. LEONARD and H. FAUBER (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 2, pp. 10-11, 19).—Additional tests (*E. S. R.*, 83, p. 186) now covering the period 1937-40 showed the corn hybrids Funk G-7, Iowa 3080, Wisconsin 455, 570, and 625, Kingscrot 311, and Minhybrid 408 to do well in comparison with Minnesota 13 at the station; Iowa 939, Funk G-19 and G-15, and Wisconsin 696 at lower altitudes on warmer soils; and in the Rocky Ford area Funk G-212 and G-167, Pioneer 307, Iowa 161, and Pfister 160 and 360A yielded high in comparison with Reid Yellow Dent (Moore strain). Under irrigated conditions at Fort Lewis at an elevation of 7,600 ft., Lico barley yielded about 50 percent more grain per acre than the best corn variety, while none of the hybrids tested matured satisfactorily as an average. Under dry-land conditions at Akron no hybrids were consistently superior to the best adapted open-pollinated corns.

Potato culture and storage investigations in 1940, E. V. HARDENBURG and V. F. NETTLES. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 3, pp. 85-89).—The review of publications involving cultural practices, seed varieties, and storage covers 25 titles.

The influence of split applications of complete fertilizer on the yield of Irish potatoes, E. P. BRASHER. (W. Va. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 3, pp. 81-85).—Field tests in two localities, 1939-40, in which 1,500 lb. per acre was applied in various treatments to potatoes up to full bloom showed that the larger quantities of fertilizer applied at planting resulted in the better yields, and the yield declined with delay in applying fertilizer after planting. Little foraging effect was noted between rows spaced 3 ft. apart on either Wheeling sandy loam or DeKalb silt loam soil, since potato plants made little use of fertilizer placed 18 in. away from the row.

Cooperative rod-row wheat trials, L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 5, pp. 17-19).—Appraising the merits of rod-row wheat trials made, 1939-40, in cooperation with farmers and students in agricultural high schools, the author considers that the nursery yields are indicative of field behavior.

The quality of Thatcher wheat grown in soil-less culture, E. A. HELGESON and R. H. HARRIS (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 5, pp. 3-6, figs. 2).—Thatcher wheat grown in tank cultures increased in protein content and loaf volume and slightly declined in test weight as the respective tanks were supplied with distilled water only or complete nutrient to different growth stages and distilled water or N only to maturity. By proper manipulation of minerals, wheat ranging from 11.1 to 24.9 percent of protein could be produced. It appeared that Thatcher wheat could take up enough of most of the needed elements during early growth stages so that from blossoming on only N is needed in large amounts,

Commercial agricultural seeds, 1940, G. P. STEINBAUER (*Maine Sta. Off. Insp.* 178 (1940), pp. 100-123).—The percentages of purity, germination, and hard seed (in legume seed) and number of noxious weed seed per pound are tabulated for 162 samples of agricultural seed collected from dealers in Maine in 1940.

HORTICULTURE

Hortus, second, L. H. and E. Z. BAILEY (*New York: Macmillan Co.*, 1941, [rev.], pp. 778, figs. [23]).—This is a new, revised, and reset edition of the previously noted publication (*E. S. R.*, 73, p. 611).

[*Horticultural studies by the Alabama Station*] (*Alabama Sta. Rpt.* 1939, pp. 34-38).—Among studies the progress of which is discussed are influence of short-day treatments on the flowering of *Kalanchoe*, and response of *chrysanthemums* to artificially controlled day length, both by E. W. McElwee; and the effect of fertilizer rates, organic material, and irrigation on the yield of turnips, by L. M. Ware.

[*Horticultural studies by the Tennessee Station*] (*Tennessee Sta. Rpt.* 1939, pp. 52-53, 54-55, 56-59, figs. 5).—Included are reports of studies, by R. D. Drain, in raspberry, pear, bean, and tomato breeding, of fruit varieties, pyrethrum improvement, comparative value of hybrid and open-pollinated sweet corns, and on the depth of planting asparagus. In addition, information is offered on work at the Mericourt Substation in testing fire blight resistant pears, variety and cultural studies with red raspberries and dewberries, culture of the tomato, improvement of pyrethrum, and culture of asparagus and rhubarb. Work at the West Tennessee Substation by L. A. Fister includes strawberry breeding, methods of transplanting tomatoes, testing of sweet corn hybrids and varieties, testing of peach varieties, and the irrigation of fall-grown snap beans.

[*Horticultural studies by the Washington Station*]. (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul.* 394 (1940), pp. 32, 33-34, 53-61, 62-64, 65-69, 91-95, 102-103, 109, 110, 111, 112).—Included are progress reports on the following investigations, by K. Groves, H. Fallscheer, J. L. St. John, E. L. Overholser, O. M. Morris, R. M. Bullock, A. L. Kenworthy, W. J. Clore, F. L. Overley, L. T. Kardos, D. F. Allmendinger, L. C. Wheating, W. J. O'Neill, S. E. Wadsworth, C. D. Schwartze, G. A. Huber, L. Campbell, C. L. Vincent, J. C. Snyder, and H. G. Nickle: Spray residue removal, factors associated with the maturity of the apple, varieties of fruits, testing the orchard cover crops, orchard fertilization and irrigation, factors affecting the set of fruit, fruit-leaf ratios in the plum, storage of fruits, relation of low soil temperatures to winter injury in fruit trees, the value of hormone sprays in retarding the drop of apples and in increasing their color, effect of various spray materials in relation to spray injury, methods of propagating hardy apple stocks, breeding raspberries for hardiness and disease resistance, breeding strawberries for better quality and resistance to black root, selection and breeding and fertilizer requirements of truck crops, orchard soil toxicity in relation to small fruit and truck crop production, and factors concerned in the bud abscission of gardenias.

Studies at the Irrigation Substation include soil moisture relationships in apple orchards by H. G. Nickle, tree and fruit responses to irrigation by W. J. Clore and A. L. Kenworthy, varieties of fruits and truck crops by Clore and Kenworthy, and fertilizer requirements of truck crops by Clore. A test of methods of hand-pollinating apple orchards at the Tree Fruit Substation was conducted by F. L. Overley. The use and production of nursery stock was studied by J. L. Schwendiman, P. E. Lemmon, W. E. Chapin, and R. L. Brown.

[Horticultural studies by the Western Washington Station]. (Partly coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpt. 1940*, pp. 29-35, 36-37, 53-55).—Among studies, the progress of which is discussed by C. D. Schwartz, L. Campbell, W. J. Clore, G. A. Huber, C. H. Rundle, M. Boggs, H. T. Campbell, and K. Baur, are strawberry breeding; raspberry breeding for hardiness and disease resistance; blackberry and dewberry testing and breeding; variety, fertilizer, and pruning trials with the blueberry; variety tests of fruits and nuts; the relationship of yield to the quality of peas for canning and freezing; variety tests of vegetables; rhubarb breeding and forcing; factors promoting first-year bloom in asparagus seedlings as a key to sex; fertilizers and inoculation of peas grown for canning and freezing; and fertilizers for sweet corn.

[Horticultural studies by the Wisconsin Station] (*Wisconsin Sta. Bul. 451* (1941), pp. 56-57, 74-82).—Brief reports are presented on studies of the development by J. C. Walker and J. P. Jolivette of disease-resistant cabbage varieties (coop. U. S. D. A.); culture and varieties of strawberries, by E. Heller and R. H. Roberts; varieties of raspberries and apples, by J. G. Moore; varieties of vegetables adapted to southern Wisconsin marsh soils, by O. B. Combs et al., including varieties of lima beans, garden beets, carrots, lettuce, onions, and spinach; fertilizers for spinach; vegetables adapted for freezing preservation, by Combs, F. W. Duffee, and H. Parsons; edible soybeans, by Combs and G. Briggs; and tomato varieties for the home garden, by Combs.

[Horticultural investigations in South Africa] (*Union So. Africa Dept. Agr. and Forestry, Rpt. Low Temp. Res. Lab., Capetown, 1939*, pp. 9-143, 161-180, figs. 53).—The following papers are included: Delayed Storage and Treatment with Acetylene as Aids to the Ripening of Bon Chretien Pears at 45° F., by J. E. van der Plank and G. F. van Wyk (pp. 9-25); Pre-storage Treatment of Santa Rosa Plums With Acetylene (pp. 25-30), Respiration of Santa Rosa Plums (pp. 30-31), Pre-storage Treatment of Kelsey Plums With Acetylene and Ethylene (pp. 31-40), and Pre-storage Treatment of Elberta Peaches With Acetylene (pp. 41-43), all by R. Davies and W. W. Boyes; The Preparation of Tablets for the Release of Sulphur Dioxide in Packages of Stored Table Grapes, by J. E. van der Plank and G. F. van Wyk (pp. 43-47); Grape Wastage Investigations, 1938-39, by J. M. Rattray (pp. 48-60); Girdling Grape Vines, With Special Reference to "Drop Berry" in Waltham Cross (pp. 60-63), and Note on the Effect of Irrigation on Drop Berries and Desiccation of Stalks in Waltham Cross Grapes (pp. 64-66), both by E. Beyers; Melon Storage Investigations, by J. M. Rattray (pp. 66-70); The Effect of Ripe Elberta and Peregrine Peaches on the Respiration of Unripe Fruits of the Same Variety at 90° F. (32.2° C.) (pp. 71-77), and A Note on the Effect of Ripe Gaviota Plums and Peregrine and Elberta Peaches on Unripe Fruit of the Same Variety at 35° F. (1.7° C.) (pp. 77-78), both by W. E. Isaac; Storage Tests With Granny Smith Apples With Special Reference to Superficial Scald (1938 Season), by W. E. Isaac and W. W. Boyes (pp. 78-87); The Relative Efficacy of *o*-Phenyl-Phenol Against Various Citrus-Rotting Fungi in Culture (p. 88), The Use of Wraps Impregnated With *o*-Phenyl-Phenol Against Mould in Citrus Fruits (pp. 88-93), and The Use of Solutions of *o*-Phenyl-Phenol and Sodium *o*-Phenyl-Phenate as Disinfectants for Oranges (pp. 93-98), all by J. E. van der Plank and J. M. Rattray; The Use of Mixtures of Chloride of Lime and Sodium Bicarbonate to Remove Sooty Blotch From Citrus Fruits, by J. E. van der Plank (pp. 98-103); The Effect of Temperatures of Storage From 40° to 70° F. on Marsh Grapefruit, by J. E. van der Plank and J. M. Rattray (pp. 103-110); The Storage of Lemons, by J. E. van der Plank, J. M. Rattray, and P. A. Crous (pp. 110-122); The Effect

of Lightly Oiled Citrus Wraps on the Behavior of Oranges in Store (pp. 122-124), and A Note on the Effect of Repacking Navel Oranges and Its Bearing on the Question of the Spread of *P[enicillium] digitatum* by Contact (pp. 124-125), both by J. E. van der Plank and J. M. Rattray; Automatic Temperature Control in Experimental Cold Storage Rooms, by G. M. Dreosti (pp. 126-143); Citrus Box Tests, by G. M. Dreosti and P. Wissing (pp. 161-172); and Testing Schedule for Export Citrus Cases, by G. M. Dreosti (pp. 173-180).

Fungicides and insecticides, 1940, E. R. TOBEY (Maine Sta. Off. Insp. 173 (1940), pp. 124-130).—The results of analyses of 44 samples of fungicidal and insecticidal materials collected during the 1940 season are presented, together with the text of the State law as an appendix.

The use of an evaporation index in timing the irrigation of muck crops, D. COMYN and J. D. WILSON (Ohio Sta. Bmo. Bul. 209 (1941), pp. 63-69).—In experiments conducted over the period 1936-39 at the Muck Crops Farm at McGuffey with several vegetable crops, it was found that the use of an evaporation index which takes into account both evaporation and rainfall, is helpful in timing and determining the quantity of irrigation water. This index was particularly valuable in timing irrigation during seasons of uneven rainfall distribution, and indicated the need of water before visual observation suggested the fact. Somewhat more water in proportion to the excess of evaporation over rainfall was required during drought periods than in those of normal rainfall. The minimum worth-while application was 1 in. of water per treatment. Leafy vegetables responded more readily and definitely to supplemental irrigation than did root crops. In a critical season one or two irrigations may increase the yield of potatoes by 50 percent or more. Onions were more subject to maggot injury under irrigation, making necessary thick plantings in the row. Soil temperatures under an irrigated crop ranged from 10° to 15° F. lower than in comparable nonirrigated areas.

Late fall bean crop requires extra care, right variety, water, L. R. FARISH (Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 5, pp. 7, 8).—How to overcome difficulties to be expected in fall production of snap beans and lima beans is briefly indicated.

A hybrid sweet corn for Tennessee, L. S. MAYLE and A. B. STRAND. (Coop. U. S. D. A.). (Tennessee Sta. Cir. 75 (1941), pp. 4, fig. 1).—Information is presented on the development of a new sweet corn designated as Tennessee Sweet Hybrid, and on the results of sweet corn variety trials.

Effects of climatological factors on yield and quality of cucumbers, H. L. SEATON and J. O. KREMER. (Mich. State Col.). (Ganner, 92 (1941), No. 15, p. 22).—That cucumber seeds require a warm soil for germination was shown in stands of 25, 37, 79, 85, and 96 percent, respectively, for sowings at East Lansing, Mich., on May 21, June 1, 10, 20, and 30. Yield was highest from the June 10 planting. The need for high intensity and duration of light was shown in the fact that it was impossible to grow a greenhouse crop at Lansing from November to March without supplemental light. Cucumber flowers would not open below 55° F., and dehiscence and nectar secretion started from 62° to 63°. Germination of pollen did not occur below 70°, with the optimum between 80° and 85°. In laboratory tests cucumber pollen was found quite sensitive to water absorption.

Growing cucumbers for pickling in Mississippi, W. S. ANDERSON (Mississippi Sta. Bul. 355 (1941), pp. 17, figs. 7; also in Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 4, pp. 3-6, figs. 7).—In addition to presenting general information as to the status of cucumber pickle production in Mississippi, cultural requirements, varieties, fertilizers, pollination needs, picking practices, control of

insect and fungus pests, etc., the author includes data on the results of breeding and fertilizer studies. Considerable progress has been made in the development of new varieties possessing disease and nematode resistance combined with desirable quality. It was found that on old agricultural soils K is particularly important. Where no K was applied in a 6-8-0 mixture the yield was 4,843 lb. per acre as compared with 8,339 lb. with the same total amount of a 6-8-4 material. Increases in the percentage of K above 4 were not profitable. On new soil there was apparently sufficient P and K but not enough N to produce good cucumber crops. It is pointed out that the kind and amount of fertilizer most profitable for pickling cucumber production vary with the character of the soil, its previous treatment, and its present fertility level.

The effects of various growth substances on the number and the length of roots of *Allium cepa*, M. LEVINE and J. LEIN (*Amer. Jour. Bot.*, 28 (1941), No. 2, pp. 163-168, figs. 2).—A very low concentration, 10^{-3} percent, of indoleacetic acid in tap water accelerated root growth and root production. Vitamin B₁ inhibited root growth, the retardation being pronounced with a 10^{-7} percent concentration, but accelerated the linear growth of onion roots provided they had been immersed previously in a 10^{-3} percent indoleacetic acid solution. Colchicine inhibited root growth, yet in bulbs exposed to a 10^{-3} percent colchicine solution following exposure to a 10^{-3} percent solution of indoleacetic acid both the formation of new primary roots and the linear growth of the roots was stimulated.

Effect of seed treatment on the stand and yield of peas, G. L. McNEW. (N. Y. State Expt. Sta.) (*Canner*, 92 (1941), Nos. 6, pp. 56, 58, 60, 62, figs. 2; 7, pp. 16, 18, 20).—Herein are discussed the results of treating the seed of different varieties of canning peas with various protective materials. Some were distinctly beneficial and others harmful in the concentrations used. It was evident that certain varieties are in greater need of protection than others.

Monthly absorption of nutrients from the soil by the Perfection pimiento plant, H. L. COCHRAN and L. C. OLSON. (Ga. Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 765-766, fig. 1).—Perfection pimiento peppers growing on Cecil sandy clay loam and fertilized at the rate of 600 lb. per acre of an 8-8-6 material were found at the end of the first month in the field to have absorbed less than 0.5 lb. of N and phosphoric acid and even smaller amounts of K, Ca, and Mg on an acre basis. Absorption increased slightly in the second month and attained a peak in the third month, declining thereafter. More N was taken up than any other element. Ca, K, Mg, and P followed in order. Despite the small amount of P absorbed it is deemed likely that relatively large applications are needed because of the rather high phosphate-fixing capacity of the soil. It is suggested that the greater part of the fertilizer be placed under the plants a few days before setting and the balance be used as a side dressing in late June.

Putting profit in tomato growing, L. G. SCHERMERHORN, J. W. CARNCROSS, B. B. PEPPER, C. M. HAENSELER, J. S. JOFFE, F. E. BEAR, and V. A. TIEDJENS (*New Jersey Stat. Cir.* 409 (1941), pp. 4).—This circular, based on a study made in 1938-40, inclusive, shows the effects of planting date, lime, fertilizer, type of soil, and control of insects and diseases on the yield and returns of tomatoes grown for commercial canning.

Modern fruit production, J. H. GOURLEY and F. M. HOWLETT (*New York: Macmillan Co.*, 1941, pp. VII+579, figs. 87).—This text, prepared by members of the Ohio Experiment Station staff, contains comprehensive information on the principles and practices of fruit production.

Hormones, horticultural chemicals, and vitamins as related to growth, fruit drop, and color, E. L. OVERHOLSER, F. L. OVERLEY, W. J. CLORE, and D. F. ALLMENDINGER. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 36 (1940), pp. 128-142, figs. 5).—Discussing the physiological aspects of growth-promoting substances and other materials, the authors report that the application at Husum, Wash., of α -naphthaleneacetic acid decreased the dropping of Bosc pears but had little effect on Anjou. At Grandview spraying with different chemicals reduced notably the drop of Delicious and to a lesser extent of Winesap. At Prosser α -naphthaleneacetic acid sprays decreased the drop on Jonathan trees, but had little effect on Grimes Golden. At Wenatchee spraying with different materials reduced the dropping of McIntosh, the benefits lasting for from 8 to 10 days. With Delicious the effect lasted for 3 weeks. In two groups of Delicious trees, one of which was sprayed moderately and the other severely enough to cause injury, it was noted that α -naphthaleneacetic acid had little effect on the latter trees. Studies with thiocyanate sprays as a means of increasing red color gave conflicting results, and in some cases caused injury to certain varieties of apples. With an increase in the concentration of soluble thiocyanate there was an increase in injury without any improvement in fruit color.

Orchard cover crop studies, F. L. OVERLEY, O. M. MORRIS, and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 36 (1940), pp. 120-124).—General information is presented on the control of weeds by cultivation, chemicals, and crop competition. In a 33-year-old, closely planted apple orchard, the soil of which showed a toxic condition from long-continued spraying with lead arsenate, it was evident that alfalfa and sweetclover could not be grown satisfactorily without previous treatment of the soil. Where the upper 3 in. were replaced by new soil a good crop of alfalfa was grown. That arsenate poisoning was shallow was shown by the fact that a good crop of alfalfa could be grown on the subsoil after removing the surface 3 in. Of various amendments, stable manure applied at the rate of from 6 to 10 tons per acre gave good results on alfalfa, sweetclover, white clover, timothy, redtop, and ryegrass. Water was essential to the establishment of cover crops irrespective of soil treatments. Rye was especially tolerant to toxic soil conditions, with late July and September seedings proving best. By permitting rye to mature seed before disking fair volunteer crops were secured. A combination method in which strips of rye were allowed to mature and other strips cultivated proved promising.

Thin fruits for vigorous trees, quality product, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 5, p. 1).—A discussion is presented of the advantages and methods of fruit thinning.

The relation of the size of fruit to the loss of weight in storage, D. V. KARMAKAR and B. M. JOSHI (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 1021-1029).—For several fruits, including apples, bananas, limes, oranges, and grapefruit, the percentage loss in weight in storage was nearly always greater in small- than in large-sized fruits. The one exception was large grapefruit stored at 68° F. The skin of small fruits was thinner than that of big fruits, and the rate of respiration was also greater. The ratio of the percentage loss in weight of small fruits to that of large ones remained practically constant during the storage period, the value varying with the temperature of the storage.

The cost of removing fruit trees, C. W. ELLENWOOD (*Ohio Sta. Bmo. Bul.* 209 (1941), pp. 29-30).—Data are presented on the cost of removing 16-year-old filler apple trees and also mature plum trees, with the comment that the expense of clearing old orchard trees from land to be used for cultivation is much greater

than that of clearing a site for pasture or other purposes for which the removal of stumps and roots is not essential.

Trials with apple trees at the State Horticultural Institution.—I, **Pruning experiments** [trans. title], O. MEURMAN ([Finland] *Valtion. Maatalouskoet. Julkaisu. (Agr. Expt. Activ. State Pub.)*, No. 107 (1940), pp. 34, figs. 3; *Eng. abs.*, pp. 30-34).—Apple trees of eight varieties planted at Piikkiö, Finland, in 1932 were divided into pairs, one tree of which was pruned lightly and the other heavily each April until 1937. Growth during the years 1933-39 as indicated by trunk increments was not greatly different in the two groups, being slightly larger in the severely pruned trees. In general, the lightly pruned trees came into fruiting earlier, especially so in the case of normally slow-maturing varieties. Differences in production were noticed in the early years in favor of the lightly pruned trees but diminished as the trees became older. In the extremely bitter winter of 1939-40 the severely pruned trees suffered much more winter injury, despite the fact that no pruning was done after 1937.

Frost injury to apple foliage in the fall, E. G. CHRIST (*N. J. State Hort. Soc. News*, 21 (1940) No. 6, pp. 1251-1253, figs. 2).—A study made in the autumns of 1939 and 1940 showed marked differences among some 140 apple varieties as to frost injury to the foliage. On October 22, 1940, there occurred a severe, killing frost, with the temperature dropping to 24° F. The degree of injury was correlated with the relative maturity of the trees at the time of the freeze. In varieties of the McIntosh group, leaves matured early and there was very little leaf injury. Among varieties showing severe leaf injury were Baldwin, Grimes Golden, Stayman Winesap, Wealthy, Winesap, and Williams. The need for frost-resistant, late-ripening varieties of apples is indicated.

Pear growing in California, L. D. DAVIS and W. P. TURTS (*Calif. Agr. Col. Ext. Cir.*, 122 (1941), pp. 87, figs. 39).—Information is presented on the status of pear production, selection and characteristics of varieties, establishment of orchards, rootstocks, training and pruning, fruiting habits, cultural care, pollination requirements, nature and control of various fungus and insect enemies, control of animal pests, harvesting and marketing, storage, etc.

Peach varietal resistance to arsenical injury, M. A. BLAKE (*N. J. State Hort. Soc. News*, 22 (1941), No. 3, p. 1307, figs. 2).—Observations extending over a period of 30-odd years on a large collection of peach varieties showed that varieties differ markedly in their resistance or susceptibility to arsenical injury to the leaves and bark. Based on a classification of varieties in 1938, the author gives examples of varieties displaying (1) none to slight, (2) light, and (3) severe injury. In the first group were Champion, Chinese Cling, Late Crawford, and Rosebud. Among the severely injured kinds were Chill, Crosby, Marquette, Rochester, Sungold, and Vedette.

Plum varieties, W. J. CLORE (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 36 (1940), pp. 142-143).—Of thirty-odd varieties tested at Prosser, Wash., Beauty was found the most promising early plum. Notes are presented also on Santa Rosa, Elephant Heart, Imperial Epineuse, and President.

The boysenberry in Ohio, L. HAVIS (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 36-38, fig. 1).—In presenting information on growth, fruiting habits, trellising, and winter protection, the author concludes that the boysenberry is well suited for canning and freezing purposes. The fruit, when fully ripe, becomes too soft for shipping, but has value for dessert and pies when used as a home-garden variety.

Results of recent strawberry variety tests, L. HAVIS (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 31-35, figs. 2).—Based on an extended test of strawberry varieties, the author reports that Premier (Howard 17) is still the standard commercial

variety for Ohio. Aberdeen proved to be a desirable late variety to follow Premier, but is soft-fleshed and very subject to decay. The varieties Catskill, Dresden, and Northstar were promising and considered worthy of trial by growers.

Strawberry variety tests show only lack of uniformity; winter injury often severe. G. BEACH (*Colo. Farm Bul. [Colorado Sta.], 3 (1941), No. 2, pp. 13-14*).—Information is presented on culture, winter protection, and varieties.

Importance of root aeration in avocado and citrus trees. A. R. C. HAAS. (*Calif. Citrus Expt. Sta.*). (*Calif. Avocado Assoc. Yearbook, 1940, pp. 77-84, figs. 2*).—Saturation for 1-, 2-, 3-, 4-, 6-, and 8-hr. periods at first twice and later three times a week of the soil in 5-gal. containers in which were growing avocado seedlings had no detrimental effect on growth. The results indicated that to cause injury to the avocado extended periods of submergence are necessary.

With Eureka lemon cuttings growing in solution cultures in Pyrex jars, aeration provided by bubbling air through a glass tube opening at the base of the jar was highly beneficial. After something over a year, two aerated cuttings weighed 1,230 gm. and two nonaerated cuttings only 315 gm. Root growth without aeration was confined to the upper portion of the solution. The aerated plants bloomed and set fruits, while the nonaerated did not flower. Oxygen content was much lower at all levels in the nonaerated jars.

In experiments with 2-yr. Valencia oranges growing in 12-gal. jars in soil that was kept constantly saturated with water, calcium nitrate and ammonium sulfate were compared as sources of nitrogen. At the end of 16 mo. the ammonium sulfate-treated trees were dead, while the others were still alive and able to recover.

Avocado research at the University of California, Los Angeles: Progress and plans. R. W. HOBSON (*Calif. Avocado Assoc. Yearbook, 1940, pp. 33-35*).—The author reports a strong tendency for large seeds to produce large seedlings and large nursery trees. In the case of Fuerte trees propagated from a high-yielding and a low-yielding parent located in different orchards there was no indication of strain difference. The young trees when grown in a single orchard produced in much the same manner. The difference in the parents is believed the result of environment, particularly temperature differences. In a test of named strains of Fuerte there was some indication that certain of the strains were inherently more productive, suggesting a tolerance difference to low mean temperatures occurring during the blooming and fruit-setting period. This variability in the Fuerte avocado was indicated in the fact that unproductive drone trees have been successfully converted into profitable trees by top working with scions from productive trees.

Floral abnormality in the avocado. C. A. SCHROEDER. (*Univ. Calif.*). (*Calif. Avocado Assoc. Yearbook, 1940, pp. 36-39, figs. 2*).—Discussing the normal flower of the avocado, the author states that he has observed abnormal blooms which differ from the normal in the number of stamens, pistils, and perianth parts. In addition fusion of parts and naked ovules were observed. Of most frequent occurrence was staminoidy, the conversion of other floral parts into stamens. Because of the great profusion of blooms in the avocado and because most of the irregularities do not necessarily impair the function of the flowers, abnormal blooms are not a serious factor in production.

Irrigation problems in citrus orchards. C. A. TAYLOR (*U. S. Dept. Agr., Farmers' Bul. 1576 (1941), pp. 11-34, figs. 221*).—This publication reports a study of irrigation practices and yields in orchards in Los Angeles and San Bernardino Counties, Calif., and recommends certain improvements in methods of cultivation that will make for better use of water not only there but in

other areas with similar conditions. Attention is directed to the water and soil losses and irregular water distribution resulting from the use of deep, narrow irrigation furrows and to the possibility of avoiding these troubles by means of wide, shallow furrows. The advantages of cross-blocking of furrows are noted, and desirable furrow lay-outs are shown. For erodible hillsides low-head sprinklers are suggested, together with alternate-middle irrigation.

Experiments on fruit-cluster thinning in the loquat, R. W. HODGSON and E. R. EGGERS. (Univ. Calif.). (*Calif. Avocado Assoc. Yearbook*, 1940, pp. 71-75).—Trees of the Early Red, Advance, Champagne, and Thales varieties were cluster thinned, with evidence that such treatment increased materially the size of the remaining fruits in approximate proportion to the percentage of clusters removed. Delayed cluster thinning which removed mostly the late-blooming clusters increased the percentage of early-maturing fruits. The loquat is said to bloom in autumn, and a period of approximately 3 mo. may be utilized in flowering and fruit setting.

Some chemical and respirational changes in the papaya fruit during ripening, and the effects of cold storage on these changes, W. W. JONES and H. KUBOTA. (Hawaii Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 711-717, figs. 3).—Green and ripe Solo papayas grown in the station plats at Kailua, Oahu, were found to have 42 and 18 percent, respectively, of their total sugar in the form of sucrose. With the hydrolyzation of the sucrose the color changed from green to yellow, the flesh softened, and there was a rise in the respired CO_2 . The peak in CO_2 elimination was reached simultaneously with full color development. Acid-hydrolyzable material dropped from 9.33 percent of the total dry weight in green fruit to 4.36 percent in ripe fruit. Since the papaya contains no starch, this decrease represented a change in cell-wall constituents and accounted, in part at least, for the changes in consistency during ripening. Cold storage stopped the ripening process and caused a chilling effect that inhibited further normal ripening upon removal to a warm room.

Developmental structure in dahlia roots, A. L. HAVIS. (Ohio Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 10, p. 5s).—An abstract of this work.

The effect of vitamin B₁ on some ornamental greenhouse plants, A. LAUREN and D. C. KIPLINGER (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 17-28, figs. 5).—Results with various ornamental plants indicated that in general the application of vitamin B₁ either to soil-grown plants or to plants grown in gravel culture has failed to justify its use for practical purposes.

Sand culture studies of the use of saline and alkaline waters in greenhouses, V. G. HELLER, R. H. HAGEMAN, and E. L. HARTMAN. (Okla. Expt. Sta.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 727-733, figs. 4).—Marglobe tomatoes growing in sand culture where sodium chloride (NaCl) and sodium bicarbonate (NaHCO_3) were supplied in varied concentration from 100 to 3,000 p. p. m. were severely injured where the concentration of either salt was increased above the range of 1,400-1,600 p. p. m. NaHCO_3 produced injuries at lower concentrations than did NaCl and, in general, was more toxic. The ash and Na content of the plants increased more rapidly and attained higher values in the plants treated with NaCl than in those treated with NaHCO_3 . Applications of NaHCO_3 reduced the Ca content very markedly from one-fourth to one-half that of the checks. Plants supplied with NaCl developed characteristic turgid, yellow leaves that curled and died.

FORESTRY

[Forestry studies by the Alabama Station] (*Alabama Sta. Rpt.* 1939, pp. 30-33).—Two studies are discussed: Selectivity of trees as a factor in spacing fine

plantings, and yields of 8-year-old slash and loblolly pines, both by L. M. Ware and J. E. Bryan, Jr.

[Forestry studies by the Wisconsin Station] (*Wisconsin Sta. Bul.* 451 (1941), pp. 99-101, fig. 1).—Among subjects discussed are the planting of jack and red pines on sandy soils by S. A. Wilde, F. B. Trenk, and A. R. Albert, and the role of mycorrhiza in the nutrition of forest seedlings by R. O. Rosendahl and Wilde.

A method for sampling the foliage of a silver maple tree, W. H. CUMMINGS. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 382-384, fig. 1).—The author discusses a sampling method whereby from measurements taken on the foliage of a random sample of branches, dependable values could be estimated for a leaf or for an entire crown of a tree. Using the method on a 47-ft. silver maple, the total number of leaves was estimated at 177,000 with a total fresh weight of 217 lb. and a leaf area of one-sixth acre. The rate of moisture loss from the leaves between 4 and 6 p. m. on a July afternoon was 58 gal., almost five-sixths of which came from the lower leaf surfaces.

A new increment core instrument and coring wrinkles, L. H. REINKE (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 304-309, figs. 3).—The construction and operation of an instrument designed for holding cores both for cutting and for viewing by either transmitted or reflected light is discussed.

A new method of detecting compression wood, M. Y. PILLOW. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 385-387, figs. 3).—This article describes a method based on the opacity to transmitted light for detecting compression wood which is particularly useful for detecting the less pronounced forms of compression. The method is sensitive to an extent that a small amount of compression wood or a mild form may be identified over relatively large cross sections when gross features are not sufficiently pronounced and microscopical examinations would be necessary for identification.

Collapse in wood as shown by the microscope, H. D. TIEMANN. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry*, 39 (1941) No. 3, pp. 271-282, figs. 10).—The type of collapse observed in the drying of greenwood, especially in extremely wet portions of the heartwood of certain species, in which cell cavities are distorted or even obliterated, is described and illustrated by photomicrographs. The collapse is caused by the hygroscopic tension produced throughout the liquid water content of the cells by the minisci existing over small interstices in completely enclosing walls during evaporation.

The trees of North Dakota, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.* 3 (1941), No. 5, pp. 8-10).—A descriptive account is presented of native and introduced species, with information as to the locality where found, growth and seeding characteristics, etc.

The black alder as a pioneer tree on sand dunes and eroded land, H. KOHNKE (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 333-334).—Through its root organisms the black alder is able to take up atmospheric N and grow very well on dry, sandy, and gravelly sites. The rotting leaves of the alder help greatly to improve soil and make it suitable for better species. The alder is considered a good nurse crop, but it may be necessary to suppress it by clipping prior to planting the permanent trees.

White pine propagation, A. G. SNOW, JR. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 332-333).—In nearly all cases where white pine cuttings rooted successfully, the sand-peat mixture had been used before and was probably infected with several species of fungus, leading to the supposition that the presence of certain fungi may have been actually beneficial either by acting as a supplementary source for natural auxins or in a symbiotic relationship.

Notes on long-lived ponderosa pine, E. SCHULMAN. (Univ. Ariz.). (*Jour. Forestry*, 39 (1941), No. 4, pp. 411-413).—Core samples taken from ponderosa pines in Plumas County, Calif., indicated that at least one of the trees was over 675 yr. of age. Similar observations on the Peter Lassen tree near Susanville led to an estimate of 500 yr. Size is misleading in indicating age, since the older trees may be much smaller than younger trees growing on more favorable sites.

Managing woodlands for piñon nuts, E. L. LITTLE, JR. (U. S. D. A.). (*Chron. Bot.*, 6 (1941), No. 15, pp. 348-349).

Cold storage of deciduous planting stock, H. D. PETHERAM and H. G. PORTERFIELD. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 336-338).—Bundled planting stock held without root covering from early March to late May in a cold storage chamber maintained at 30°-32° F. with a high relative humidity grew satisfactorily when planted in the field. The species included dwarf Asiatic elm, honeylocust, common locust, two cottonwoods, hackberry, and Osage-orange. It is indicated that the trees could withstand 28° without freezing of the sap and that harmful molds could not develop below 34°.

The effect of natural pruning on the protective value of a windbreak. D. DENUYL. (Purdue Univ.). (*Jour. Forestry*, 39 (1941), No. 3, pp. 335-336).—Records taken in 1940 and compared with those taken in 1933 (E. S. R. 75, p. 784) before natural pruning occurred indicated that natural pruning in the interior of a four-row Norway spruce windbreak resulted in only a very slight loss in its efficiency in modifying winds. This was explained by the fact that the two outer tree rows maintained their foliage.

The role of fire in the perpetuation of virgin forests of northern Wisconsin, D. K. MAISSUROW (*Jour. Forestry*, 39 (1941), No. 2, pp. 201-207).—Stating that forest fires have in the last five centuries burned through 95 percent of the virgin forest of northern Wisconsin, the author asserts that fires have been necessary factors or agents in the perpetuation of a number of species such as yellow birch, hemlock, pines, and intolerant hardwoods, thus shaping and determining the form and composition of the forest. Fires of unusual intensity may interfere with the successful restocking of the forest and result in the formation of grass or shrub subclimaxes and understocked silviculturally worthless stands. Fires from a broad ecological viewpoint are a normal, beneficial, and necessary factor in the perpetuation of virgin forests.

Theoretical analysis of smoke-column visibility, H. D. BRUCE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 3, pp. 161-178, figs. 6).—A theoretical analysis is presented of the visibility of a smoke column from a forest lookout, to aid in the clarification of ideas on the physical basis of smoke detection. The visibility of the smoke is considered to be its contrast in brightness with the background. The contrast ratio is expressed in terms of the light flux entering the observer's eye from the smoke, the haze, and the background and the flux in terms of the scattering and reflecting properties of the various elements. An equation is suggested for the maximum distance a given smoke may be seen under specified conditions. The equation is simplified by substituting close-up brightness ratios for elementary scattering functions and by drawing approximations through the introduction of simple assumptions. The equations pertain to various types of illumination and to smokes seen against both sky and terrestrial background.

The theory indicates that the maximum distance at which a smoke is visible is inversely proportional to the amount of haze in the atmosphere, the proportionality factor being the logarithm of a complex quantity involving the sun's azimuth along with certain characteristics of background, the smoke, the illumina-

tion, and the vision. For the practical utilization of the derived equations there are suggested several procedures of increasing complexity leading to diminishing standard error in the estimation of maximum visibility distances.

Financing fire protection for timber lands under Oregon laws, W. H. DRESEN (*Oregon Sta. Bul. 384* (1940), pp. 27, fig. 1).—The State and Federal legislation regarding fire protection of timberlands is outlined and discussed. Appendixes show the Federal allotments by States for forest fire protection, the forms used by private owners, operators, and private patrol associations in submitting data as to receipts and expenditures to the State forester, and by forest fire associations, and a description of the organization and activities of the personnel of such associations. The funds collected in 1938 consisted of approximately \$144,000 from "tax-roll" lands, \$90,000 from members of protective associations, \$91,000 from State appropriations, \$126,000 from the Federal Clarke-McNary funds, and \$19,000 from county contributions.

DISEASES OF PLANTS

[Plant disease work by the Alabama Station] (*Alabama Sta. Rpt. 1939*, pp. 15, 19).—Brief summaries of progress are included on the effects of fertilizers and varieties on cotton wilt, by H. B. Tisdale and J. B. Dick; and soybean virus control by resistant varieties, by H. R. Albrecht.

Diseases of field crops, R. E. SMITH (*Calif. Agr. Col. Ext. Cir. 121* (1941), pp. 79, figs. 43).—An illustrated handbook on the diseases prevalent in California and their control, arranged alphabetically by common names of plants, and with a general section on fungicides and their application.

Recent trends in plant disease control, N. E. STEVENS. (Univ. Ill.). (*Ill. State Acad. Sci. Trans.*, 33 (1940), No. 2, pp. 66-67, fig. 1).—A definite and continuous change was found to appear in those recommendations dealing with the addition of small amounts of essential chemical elements to correct what are now well known as soil deficiencies. Except for this single item, the study revealed little to indicate very marked changes in the basic principles of disease control in recent years. This may indicate either the inherent conservatism of plant pathologists or the difficulty of improving greatly on the basic methods, many of which were discovered over a century ago.

[Plant disease observations and studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1939*, pp. 16-17, 62-64).—Seasonal notes on potato scab prevalence are presented, together with brief reports, by C. D. Sherbakoff, of progress on studies of *Fusarium* wilt of crop plants (mainly cotton (coop. U. S. D. A.), tomato, and watermelon), wheat breeding for local adaptation and resistance to leaf and stem rusts, strawberry breeding for black root resistance, local differences in nematode ability to induce root knot on tomato and cotton, tests of cotton progenies for *Verticillium* wilt resistance, spraying and dusting for tomato leaf spot (*Alternaria* and *Septoria*) control, and red clover resistance to anthracnoses and powdery mildew.

[Work on plant diseases by the Washington Station]. (Partly coop. U. S. D. A. and West. Wash. Expt. Sta.). (*Washington Sta. Bul. 394* (1940), pp. 61-62, 70-78, 100-101, 105-106).—Progress reports by E. L. Overholser, F. L. Overley, D. F. Allmendinger, A. L. Kenworthy, C. S. Holton, E. F. Gaines, F. D. Heald, J. D. Menzies, H. English, G. W. Fischer, L. Campbell, C. D. Schwartz, L. K. Jones, G. A. Huber, and D. J. Crowley are included on spot diseases of apples and pears (cork spot, stony pit, and bitter pit); diseases of stone fruits; wheat and oats smuts; etiology and control of apple and pear rots and of alfalfa failures; diseases of forage grasses, alfalfa, corn, and sugar beets;

bean rust; running-out of strawberries; virus diseases of potatoes, cineraria, and of brambles; diseases of greenhouse plants; carnation yellows; seasonal report on the prevalence of various plant diseases in the State; asparagus rust; and fungus rots of cranberries and their fungicidal control.

[Plant disease studies by the Western Washington Station] (*Western Washington Sta. Rpt. 1940, pp. 6, 7, 37-41, 41-42, 55-56*).—Brief reports by G. A. Huber, K. Baur, and L. Campbell are included on soil application of calcium cyanamide for controlling brown rot of stone fruits and studies of the *Sclerotinia* species concerned; leaf roll and net necrosis of potatoes and their control; spraying for control of tulip diseases; raspberry mosaic and its control; boron deficiency in alfalfa; and studies of the running-out diseases of strawberries, believed due to yellows and crinkle viruses and to root rots (coop. Wash. Expt. Sta.).

[Plant disease work by the Wisconsin Station]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 451 (1941), pp. 52-56, 57-70, 84, 85, 89-91, figs. 6*).—Progress reports are given by A. R. Albert, W. B. Allington, R. W. Fulton, R. H. Gruenhagen, J. Johnson, J. P. Jolivet, R. H. Larson, F. J. LeBeau, L. J. Meuli, A. J. Riker, L. F. Roth, J. C. Walker, G. H. Rieman, and O. C. Whipple on many new developments in the boron deficiency problem, including the carry-over effects of boron, effect of boron on sugar beets and other crops, varietal differences in garden beets and cabbages to boron deficiency, the value of mulching in the prevention of boron deficiency and tendency of liming to promote it, the margin of safety in boron applications, and the State boron-deficiency survey; two viruses responsible for cabbage mosaic; cabbage black rot control; all carrot varieties tested susceptible to wilt; sulfur reducing potato scab for at least 5 yr.; clover leafhopper transmitting potato mosaic; temperature effect on potato ring rot development; some potato varieties escaping yellow dwarf and scab; bacteria of potato ring rot infecting tomatoes; dusting v. spraying for tomato diseases; conditions favoring damping-off of conifer seedlings, including temperature, moisture, and soil reaction, and control measures; pine twig blight favored by rainy weather; plant-bed sprays controlling tobacco wildfire; tobacco mosaic virus moving downward much faster than upward in the plant; and inactivation of plant viruses by milk, blood serum, citrus fruit extracts, and by bacterial and fungus growth products.

Pathology, J. P. MARTIN (*Hawaii. Sugar Planters' Assoc. Ptd. Rpts., 60 (1940), Hapt. Sta. Com. Rpt., pp. 22-36*).—The progress reports given include studies of foreign sugarcane diseases and cane diseases of Hawaii (chlorosis, chlorotic streak, *Helminthosporium sacchari* eyespot, leaf scald, malformations including stem galls, mosaic, red rot, and physiological disorders).

[Report of the chief of the section of phytopathology of the agricultural experiment station at La Molina], G. G. RADA ([*Peru Min. Fomento, Dir. Agr. y Ganaderia Mem. 12 (1940), pp. 211-262, pls. 2*)].—Reports are included on the results of studies of the influence of irrigation on *Verticillium* wilt of cotton and control of stem rust of wheat (*Puccinia graminis tritici*) by applications of the proprietary fungicide "Asporital."

On the history of phytopathology in Brazil, A. E. JENKINS. (U. S. D. A.). (*Chron. Bot., 6 (1941), No. 10, pp. 224-226*).—A review of a paper on the history of phytopathology in Brazil by Puttemans, an English translation of which has been previously referred to (*E. S. R., 84, p. 771*).

Some questions of general phytopathology [trans. title], L. PETER (*Ann. Facoltà Agr. R. Univ. Pisa, n. ser., 3 (1940), pp. 229-261, figs. 7; Fr., Ger., Eng. abs., pp. 229-250*).—In the light of recent research, the author reviews some of the fundamental aspects of plant pathology, including immunity and resistance

with respect to diseases and parasitic insects, predisposition, pathological processes to degeneration from age, and the variability of parasitic micro-organisms.

Saprophytes antagonistic to phytopathogenic and other microorganisms. P. A. ARK and M. L. HUNT. (Univ. Calif.). (*Science*, 93 (1941), No. 2415, pp. 354-355).—A preliminary note, with special reference to 2 soil bacteria found antagonistic to 16 bacterial and 6 fungus phytopathogens. Several other micro-organisms tested exhibited similar antagonisms. The antagonistic substances produced were water-soluble and active in extremely small amounts.

Susceptibility to disease in relation to plant nutrition. W. THOMAS and W. B. MACK. (Pa. State Col.) (*Science*, 93 (1941), No. 2408, pp. 188-189, fig. 1).—When the severity of a disease differs under different fertilizer or environal conditions affecting nutrition it becomes important to know in what respects nutrition differs under the various conditions and in relation to the severity of the disease. An example is given of use of the foliar diagnosis method in obtaining this information with respect to the virus streak disease of tomato.

Density and flowability of insecticidal and fungicidal dusts and dust ingredients. J. D. WILSON and M. A. VOSEL (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 69-79).—The use of fungicidal dusts prepared with fixed coppers (with or without insecticides) has increased rapidly, a large proportion being premixed by manufacturers. The competition for sales is so keen that a wide range of ingredients (particularly diluents) has come into use. The properties of weight per unit of volume and flowability through the feed aperture of a duster naturally vary widely. As a result, comparisons of different materials may easily become, instead, a comparison of different amounts of materials. It was thought that a better knowledge of the density and flowability of the ingredients which go into these dust mixtures might enable investigators, by altering the proportions of heavy and light diluents and slow and fast flowing materials, to prepare formulas which could be applied at comparable rates per unit of plat area. The data presented are those obtained in what is considered to be only the beginning of this type of investigation.

The copper content (stated as the metallic equivalent) of the fixed copper compounds studied varied from 86 percent for Cuprocid GA to 23 percent for copper oxalate, whereas the density (stated as grams per cubic inch) varied from 16 gm. for Cuprocid GA to 2.07 gm. for copper oxychloride sulfate. Density is not entirely a function of particle size. The rate at which these materials flowed through a hand duster under standard conditions varied from 2.1 lb. per minute for Cupro-K to 0.40 gm. for Coposil. When the various copper compounds were mixed with wheat flour and EM 23 talc, the densities of the mixtures varied only from 7.22 gm. for the mixture containing Cuprocid GA to 6.22 gm. for that made up with Coposil, and the rate of flow when mixed with flour and EM 42 talc varied from 1.87 lb. with Cuprocid GA to 0.84 lb. with Coposil, a variation of over 200 percent.

The diluent materials studied were talcs, clays, gypsum, and whiting of various particle sizes, and diatomaceous earth. The talcs varied in density from 2.7 gm. for EM 29 to 9.68 for EM 42. The clays varied over a much narrower range of density and as a group were less dense than the talcs. Gypsum and whiting are comparatively heavy unless ground to extremely fine particle size. Diatomaceous earth and its variations in Dicalite and Celite are the least dense of the common diluents. The adhesives considered were bentonite, wheat flour, and soya flour. The diluents influence the density and flowability of the mixed dust formula more than the copper compounds, being used in larger quantities. When the proportions of light and heavy diluents were varied

in a single formula to obtain mixtures of different densities and flowability, it was found that density decreased steadily and rather evenly with each increase in the lighter diluent but that flowability changed little after the amount of low-density diluent passed 20 percent of the total mixture. Proprietary dust mixtures available on the market varied in density from 0.8 gm. to 4.88 gm. per cubic inch and in flowability from 2.7 lb. to 0.8 lb. per minute.

Preparation of inoculum with a mechanical liquefier, C. F. ANDRUS. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 566-567).—Using a high-speed cocktail shaker-type electric mixer, cultures of pathogenic fungi from agar or fluid media were broken up into fine particles which produced abundant infection, eliminating the need for spores. The method was successfully used with *Macrosporium solani* and *Stemphylium solani* on tomatoes and with *Colletotrichum lindemuthianum* on beans. Tomatoes were inoculated by inverting the potted plants and dipping the foliage in the liquid inoculum.

The use of methyl bromide as a means of detecting latent infections by Colletotrichum spp., G. K. PARRIS and W. W. JONES. (Hawaii Expt. Sta.). (*Phytopathology*, 31 (1941), No. 6, pp. 570-571, fig. 1).—Experimenting with methyl bromide fumigation of papaya fruits and string beans infected by *Colletotrichum* anthracnoses, it was found that the treatment accentuated and accelerated the development of the fungi. By thus bringing to light infections that otherwise would remain temporarily or permanently latent, methyl bromide treatment may prove useful in determining susceptibility to fungus infections.

A solution-culture infection method used in the study of Fusarium wilts, G. M. ARMSTRONG. (S. C. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 549-553, fig. 1).—In the simple inoculation technic devised and here described, the roots of seedlings are submerged for a short time in a nutrient solution culture of the fungus so that a large number of filaments and spores adhere to the roots. A high percentage of infection was obtained within 5-9 weeks in the greenhouse, and equally severe infections frequently occurred locally in the field. *Fusarium* isolates with different degrees of virulence in soil tests gave similar results by the solution culture method. The technic may supplement other methods as a rapid test procedure in breeding plants for resistance to wilt diseases and in studies of the course of infection and nature of resistance in plants subject to infection by soil-borne organisms.

The effect of sodium nitrate on Fusarium oxysporum cubense, C. H. MEREDITH. (*Phytopathology*, 31 (1941), No. 6, p. 564).—Cultures were placed on mixtures of clay soil with NaNO_3 at different concentrations. After 16 days no penetration was observed in the 3.125-percent mixtures, and 1.538 percent slowed down the fungus growth.

A member of the Ustilaginaceae new to the flora of Argentina, Crozalsiella argentina n. sp. [trans. title], E. HIRSCHHORN (*Inst. Mus. Univ. Nac. La Plata, Notas*, 5 (1940), Bot. No. 30, pp. 235-240, figs. 3).—This new smut is reported on *Panicum demissum*.

Viruses—the borderland of life, F. M. BURNET (*Austral. Jour. Sci.*, 3 (1941), No. 4, pp. 81-88, fig. 1).—A lecture summarizing the present status of the subject.

Some chemical, medical, and philosophical aspects of viruses, W. M. STANLEY (*Science*, 93 (1941), No. 2407, pp. 145-151).—A review of recent progress in research on the nature of plant viruses.

The structure of viruses, W. M. STANLEY (In *The Cell and Protoplasm*, edited by F. R. Moulton. Lancaster, Pa.: Science Press, 1940, pp. 120-135).

Evidence against the hypothesis that certain plant viruses are transmitted mechanically by aphides, M. A. WATSON and F. M. ROBERTS (*Ann. Appl. Biol.* 27 (1940), No. 2, pp. 227-233).—Individuals of *Myzus persicae*, when given

an adequate fasting period followed by 2-min. feeding on the infected plants, were found to transmit *Hyoscyamus* 3, potato Y, and severe etch viruses from tobacco to a number of successive healthy plants, the number infected apparently being that on which the aphids can be given 2-min. feeding periods within the time for which they would normally retain their infectivity if prevented from feeding at all. The results detailed are believed to confirm the authors' previous theory that loss of infectivity is not due to cleansing of the stylets while feeding or to normal deterioration of the virus while fasting. The viruses appear rather to be inactivated by some substance produced by the aphids after they have been feeding for about 2 min. Persistent viruses (retained by vectors for indefinite periods) are not affected by this substance. Most of the major differences in results of transmission tests with the two types of virus could be accounted for by differences in reaction to the inactivating substance produced by the vectors. It thus becomes unnecessary to postulate fundamentally different mechanisms of transmission for the two types.

Physiological studies of *Puccinia glumarum* [trans. title], W. STRAIB (*Zentbl. Bakt. [etc.]*, 2 Abt., 102 (1940), Nos. 7-9, pp. 154-188, figs. 5; 10-11, pp. 214-239, figs. 5).—The author presents the results of studies of differences in germination of various races of the wheat stripe rust fungus and of the effects of various host and environmental factors on the process and on infection of wheat and barley.

Physiologic races of *Puccinia graminis* in the United States in 1939, H. C. STAKMAN and W. Q. LOEGERING. (Coop. Minn. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1941, H-522, pp. 14, pls. 2).

Further studies on the oat smuts, with special reference to hybridization, cytology, and sexuality, O. S. HOLTON. (Wash. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 4, pp. 229-240, figs. 3).—The author describes seven physiologic races of buff smut which arose through mutation or by hybridization with *Ustilago avenae* or *U. levis*. Its mature chlamydospores contain a single, diploid nucleus. Reduction division accompanies germination and each promycelium cell contains a single haploid nucleus, as do the sporidia. When two sporidia fuse, the nucleus from one passes into the other and both pass into the infection hypha. The factor for powdery sorus type is dominant over that for indurate sorus type, and segregation and recombination of these factors occur on a simple 3:1 ratio basis. Active and passive participation of sporidia of the oats smuts fusion appears to depend, at least in part, on the "physical" condition of the sporidia rather than on their sex, e. g., sporidia budding on plain agar respond more rapidly to the fusion stimulus than those budding on potato-dextrose agar.

Thiuram sulfide for turf diseases, G. E. HARRINGTON (*Science*, 93 (1941), No. 2413, p. 311).—In the tests reported, tetramethylthiuram disulfide success fully controlled both brown patch and dollarspot of turf.

Seed-borne diseases present problems, W. F. CROSTER. (N. Y. State Expt. Sta.). (*Natl. Seedsman*, 7 (1940), No. 5, pp. 34-35).—Notes on studies of seed-borne diseases of peas, vetch, and kidney beans.

Comparison of rates of apparent photosynthesis and respiration of diseased and healthy bean leaflets, G. K. PARRIS. (Hawaii Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 3, pp. 179-192, figs. 2).—No statistically significant differences in CO₂ assimilation per unit area in unit time or in growth were found between the members of a pair of healthy and opposite bean leaflets, whereas those infected with *Colletotrichum lindemuthianum* assimilated 24 percent less CO₂ than healthy companion leaflets and were restricted in growth by approximately 1.6 percent. No statistically significant respiratory difference

was found between diseased and healthy leaflets. *Erysiphe polygoni* did not reduce normal assimilation until yellow was produced by the fungus, and no significant respiratory difference was found between mildewed and healthy leaflets. Feeding injuries by thrips (*Heliothrips haemorrhoidalis*) caused a loss of chlorophyll, yellowing, and an appreciable reduction in the assimilation rate, the reduction being proportional to the apparent severity of insect damage.

Further studies on the inheritance of resistance to powdery mildew of beans, B. DUNDAS (*Hilgardia* [California Sta.], 13 (1941), No. 10, pp. 549-565).—The method of detached leaves in petri dishes previously described (E. S. R., 76, p. 641) was used in determining the susceptibility of F_1 , F_2 , and F_3 in crosses of susceptible and resistant bean varieties, though for certain F_2 progenies field inoculation was also employed. The varieties Striped Hopi, Lady Washington, Hungarian, Yellow, Long Kidney, *Phaseolus vulgaris* 5053, and Pinto proved resistant at all stages, Pink was susceptible in its youngest but resistant in older stages, several varieties were susceptible, and Long Roman was semiresistant in the field but susceptible in the laboratory tests. The F_2 of Robust (S) \times Striped Hopi (R) segregated as 3 resistant to 1 susceptible, thus establishing the resistance to mildew to be due to a single dominant factor pair. Similar results followed various other crosses detailed. In crosses between a number of resistant varieties (named), F_1 , F_2 , and F_3 were all resistant, indicating that they carried the single factor for mildew resistance.

New development in cabbage disease control, J. H. MUNCIE. (Mich. State Col.). (*Canning Age*, 22 (1941), No. 5, p. 251).—An abstract. Cooperative tests in [18] States indicated that Semesan is far superior to zinc oxide or red copper oxide for control of damping-off in cabbage.

The effect of leaf rust on the carotene content of white clover, J. T. SULLIVAN and S. J. P. CHILTON. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 554-557).—White clover leaves infected with *Uromyces trifolii trifolii-repentis* contained 21 percent less carotene than those on adjacent plants protected by sulfur. Sulfured rust-resistant plants contained 10 percent less carotene than similar nonsulfured plants. Rust-infected leaves were considerably lower in carotene than rust-free leaves from the same plant.

Two physiologic races of *Helminthosporium maydis* in the Corn Belt, A. J. ULLSTRUP. (U. S. D. A. and Ind. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 6, pp. 508-521, figs. 6).—The author reports two physiologic races of *H. maydis* on corn in the Corn Belt, morphologically indistinguishable but separable on the basis of host specialization. Race I has thus far been found to attack only one inbred line, Pr, all other inbreds and hybrids tested having shown high resistance. This race is highly virulent on Pr and produces a distinct set of symptoms. Race II is less virulent, shows little host specialization, and produces symptoms differing from those produced by Race I on inbred Pr. No ascomycetous stage of the fungus has yet been found. The virulence of the two races was tested on the small grains, sugarcane, rice, sorghum, and Sudan grass, none of which proved susceptible. Searches for wild grass hosts have thus far been fruitless. Both races appear to be seed-borne. The possibility that these races have originated in the Corn Belt is discussed.

A critical study of the nutritional requirements of *Phymatotrichum omnivorum*, P. J. TALLEY and L. M. BLANK. (Tex. Expt. Sta. and U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 1-18, figs. 3).—Using synthetic solutions and factorial experiments, the proper balance between K_2HPO_4 and $MgSO_4$ was found as important as the direct effect of either salt. If the proper balance is maintained, their concentrations can be decreased 50 percent or increased 400 percent without significant change in the amount of fungus growth. The K

ion proved more important in this balance than the phosphate radical. The chloride radical was either nonessential or was sufficient as impurities in the reagents. There was no significantly superior combination of salts for supplying inorganic nutrients, and the range of tolerance for each of the major essential ions was relatively broad. A solution containing 0.008 M of K_2HPO_4 , 0.003 M of $MgSO_4$, 0.002 M of KCl, and 2 p. p. m. of Fe, Mn, and Zn was not significantly improved by changing the concentration of any one of these salts or their ions. The solution was balanced, and growth was determined by the N supply or the available C. The growth rate increased with the supply of NH_4NO_3 , holding over a certain range beyond which growth decreased rapidly. With extremely high concentrations of this salt the responses to different concentrations of K_2HPO_4 and $MgSO_4$ were irregular. The increased growth rate with higher N concentrations failed to increase the efficiency of C utilization. If the C source (glucose) is not a limiting factor the growth rate may be regulated by the N supply; if it is, there is little if any gain by increasing the N. Increasing the C heightens the amount of growth but lowers the apparent efficiency of C utilization.

Chemical dust disinfectants increase stands, yields, and money returns from cotton, in tests conducted 12 years, L. E. MILES (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 5, p. 2).—Tests in Mississippi over a 12-yr. period are reported to have shown that cottonseed treatment with certain disinfectants prior to planting will prevent losses due to poor stands and will yield high returns in profit for the small amount invested. Ethyl mercury chloride and ethyl mercury phosphate (Ceresan and New Improved Ceresan, respectively) gave best results among the dusts tested.

Prevention of seedling blight in the flax crop, A. E. MUSKETT and J. COLHOUN (*Nature [London]*, 146 (1940), No. 3688, p. 32).—Seed treatment by a dust having tetramethylthiuram disulfide as its active ingredient is reported to have given promising results in controlling seedling infection by *Colletotrichum lini*.

The inheritance of resistance to powdery mildew (*Erysiphe cichoracearum*) in lettuce, T. W. WHITAKER and D. E. PRYOR. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 534-540, figs. 2).—The symptoms and incubation periods on *Lactuca scariola* and progeny of *L. scariola* × *L. sativa* are presented. Since the finding of perithecia with associated reproductive structures permitted identifying the fungus, the vegetative and reproductive organs are described in some detail. Strains of lettuce homozygous for susceptibility and for immunity were isolated. Appropriate matings combined with analyses of F_2 and F_3 data showed immunity to be controlled by a single dominant gene.

Potato spray studies in 1940, R. H. DAINES and J. C. CAMPBELL (*N. J. State Potato Assoc., Hints to Potato Growers*, 21 (1940), No. 6, pp. [1-3]).—A summary of seasonal results of local spray tests in New Jersey.

The effect of the latent virus (virus X) on the yield of potatoes, J. G. BALD and D. O. NORRIS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 4, pp. 252-254).—The results support the view that virus X is one of the chief causes of yield reductions of potatoes in Australia.

Fluorescence of diseased potatoes, L. H. FLINT and C. W. EDGERTON. (La. State Univ.). (*Phytopathology*, 31 (1941), No. 6, p. 569).—In tests in Louisiana, both bacterial ring rot and *Fusarium* stem-end rot are reported to have fluoresced under ultraviolet irradiation so that it has been necessary to depend on the Gram stain for identifying the former.

A second report on the effect of agronomic practices on the incidence of *Rhizoctonia* and scab of potatoes, F. M. BLODGETT. (Cornell Univ.). (*Amer.*

Potato Jour., 17 (1940), No. 11, pp. 290-295).—Results of three rotation tests in New York State in 1939 are said to confirm those of the previous report (*E. S. R.*, 81, p. 384).

Ring rot, a new and destructive potato disease in Nebraska, J. H. JENSEN (*Nebr. State Bd. Agr. Ann. Rpt.*, 1940, pp. 442-444).—A brief note on this bacterial disease and on the first evidence of its occurrence in Nebraska in November 1938.

Notes on progress of ring rot investigations of the potato, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 5, pp. 6-7, fig. 1).—A brief summary, including use of ultraviolet light for identification and disinfection of seed pieces (particularly by the acid-mercury method).

Experimental work for the control of ring-rot of potatoes, G. H. STARR (*Wyo. Expt. Sta.*). (*Amer. Potato Jour.*, 17 (1940), No. 12, pp. 318-322).—A brief summary of tests of the relative efficiency of potato disinfectants in controlling spread via the cutting knife, the effect of treating an infected seed lot before and after cutting, whole v. cut seed and resulting ring rot, results of selecting healthy appearing tubers from an infected lot of seed, and the amount of spread by the cutting knife and by contact of tubers. Two tabulations of results are included.

Results of experiments in control of bacterial ring rot of potatoes in 1940, T. P. DYKSTRA (U. S. D. A.). (*Amer. Potato Jour.*, 18 (1941), No. 2, pp. 27-55).—The data from reports of investigators in various States indicated that ring rot is highly infectious and readily transmissible by the cutting knife or by contact between tubers, but that it is sometimes difficult to infect potato plants by using *Phytomonas sepedonica* from artificial culture as inoculum. Spread by an assist-feed planter is negligible, but the picker planter may double or treble the amount of infection. Sacks in which infected tubers had been stored retained the organism for as long as 121 days. The evidence appears to indicate that spread under natural field conditions is not important. Ordinarily the organism does not overwinter in the soil, but volunteer plants may carry it over. Corrosive sublimate, acidulated or not, gave satisfactory results in controlling spread from tuber to tuber, and also (along with 1-percent iodine solution) successfully disinfected the cutting knife. A large part of the soft rot in ring rot tubers was found to result from *Erwinia carotovora*. The Gram-stain smear method of testing stems of potato plants for ring rot infection makes possible the elimination of diseased tubers. The ultraviolet light method has also given highly satisfactory results, but proper equipment and full knowledge of operation are essential to its use. The extensive educational campaign (1940) relating to this disease is noted.

Experiments with fungicides for use against *Sclerotium rolfsii* in soils, A. E. DAVEY and L. D. LEACH (*Hilgardia [California Sta.]*, 13 (1941), No. 10, pp. 523-547).—*S. rolfsii*, cause of southern rot of sugar beet, grew on media at a wide range of pH values, and in the field appeared to be but slightly affected by values up to pH 8. Liming of soils, except with excessive amounts, failed to reduce significantly the infection of carrots in the laboratory, and moderate applications in the field (one trial) only slightly reduced the infection in sugar beets. Of 17 water-soluble agents considered as of possible value against soil fungi, tested in the laboratory and most of them also in the field, none proved more effective than formaldehyde under all conditions, though several, including ammonia, were more potent in vitro. Formalin at 1:100 applied at 3 gal. per square foot of soil surface killed all sclerotia (one exception) to a depth of 6 in., whereas ammonia and sodium hydroxide at the same dilution and rate failed to decrease their viability noticeably. Early removal of affected beets and chemical disinfection of the surrounding soil reduced the infestation only

to the adjacent plants in the same row. Properly confined in laboratory tests, 2 cc. of chloropicrin per square foot of soil surface injected to a 6-in. depth killed to a depth of 1 ft. in the soil types used, but results with xylene, tetrachlorethane, and pentachlorethane were unsatisfactory. The one field test with chloropicrin was insufficient for conclusions, but when used in the surface zone of piles of screenings at sugar beet receiving stations, about 97 percent of the sclerotia were killed. It was difficult to confine the gas in screenings, but their disposal in isolated spots has rendered treatment unnecessary.

Eye spot and brown stripe: A report on diseased sugarcane leaves from Sena sugar estates, A. McMARTIN (*So. African Sugar Jour.*, 24 (1940), No. 12, p. 653).—Notes on the occurrence of eyespot (*Helminthosporium sacchari*) and brown stripe (*H. stenospilum*) in this South African area, on their control, and on their distribution elsewhere.

Myriogenospora on sugar cane in Louisiana, E. V. ABBOTT and R. L. TIPPETT. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 564–566, fig. 1).—In Louisiana (1940), *M. aciculisporeae* was found infecting eight stools of the C. P. 28/19 variety, diseased plants being characterized by extreme stunting and adherence of the tips of unfolding leaves to the midribs of adjacent leaves by a black stroma. It is suggested that the fungus may possibly be the same as that causing a similar disease on *Andropogon*.

Control of the blue mould disease of tobacco, L. W. KOCH (*Canada Dept. Agr. Pub.* 716 (1941), pp. 4, figs. 2).

Virus distribution in mosaic-resistant tobacco and its relation to pattern development in susceptible varieties, W. D. VALLEAU and S. DIACHUN. (Ky. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 4, pp. 241–247, pls. 2, fig. 1).—The distribution of a bleaching strain of virus found in mosaic-resistant Burley tobacco with its resistance derived from Ambalema indicated an accurate correlation with the patterned areas of leaf-blade tissue. Green areas proved to be virus-free. The value of a bleaching strain of virus in breeding for mosaic resistance is noted. This study of virus movement in resistant plants also elucidates pattern development in susceptible plants. Ordinary mosaic patterns result from virus particles deposited in partly grown leaves where they multiply early, thus preventing normal chlorophyll development in patterned areas. Speckled mosaic results from infection with a very slowly, and ring mosaic from a slightly more rapidly multiplying bleaching strain. Masked mosaic is explained as infection with a nonbleaching strain which multiplies at about the rate of a ring mosaic virus.

Virus distribution in the leaves of mosaic-susceptible tobacco plants inoculated at topping time, W. D. VALLEAU and S. DIACHUN. (Ky. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 4, pp. 249–254, figs. 2).—Following inoculation at topping, susceptible Burley tobacco is invaded slowly if the leaves have first attained almost full size. The top leaves before blooming are invaded in scattered spots, but soon age enough to localize the virus to some extent in the slowly increasing spots. Virus advances into mature leaves are very slow, more than a month being required for inoculated leaves to become invaded along the midrib base. Infection at topping has but little effect on the quality of cured leaf unless topping and inoculation occur as the flower buds just begin to show, in which case the value of the upper leaves may be lowered. The virus distribution of bleaching strains in mature Burley leaves is accurately indicated by the chlorotic patterns.

Inhibition of increase and activity of tobacco-mosaic virus under nitrogen-deficient conditions, E. L. SPENCER (*Plant Physiol.*, 16 (1941), No. 2, pp. 227–239, fig. 1).—Turkish tobacco seedlings grown in sand cultures and supplied a

complete nutrient solution (N level 200 p. p. m.) were inoculated with tobacco mosaic virus. Ten days later they were divided into two groups, one (1) continuing to receive the complete solution and the other (2) receiving all nutrients but N. The expressed juice of plants harvested at 4-day intervals was then assayed for relative virus activity, total protein, and virus protein. In (2) the virus-protein and soluble plant-protein contents remained practically constant, whereas in (1) each increased more than 5 times during a 16-day period. Although no decrease in yield of virus protein in (2) could be detected, its biological activity decreased more than 40 percent. The mechanism of this inactivation is not known. As far as the N-deficient plant was concerned, the virus protein acted as a foreign protein, for the virus was apparently not affected by the normal proteolytic processes of the plant. Even a plant with severe N deficiency was unable to use in synthesizing its normal proteins any N previously utilized by the virus. On the other hand, the virus was unable to utilize any N tied up in the proteins normally present in a N-deficient plant, for in the absence of an external supply of N no further virus multiplication could be detected.

Experimental production of symptoms in so-called recovered ring-spot tobacco plants and its bearing on acquired immunity, W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 6, pp. 522-533, figs. 3).—Studies are presented of the reduced temperature (20° C.) effects on tobacco plants which had entered the period of "recovery" after inoculation with six distinct seed-transmitted strains of this virus. Extensive chlorosis and sometimes necrosis, especially of leaf tips and margins, developed on young leaves within about 48 hr. after changing from 26° to 20° on plants inoculated with five of the six strains used. The sixth strain caused pollen abortion and partial or complete failure to set seed. The data are believed to indicate that tobacco does not recover from ring spot but simply enters a second phase of disease in which, because of early cellular invasion, there is no opportunity for ring development.

Club root disease (*Plasmodiophora brassicae* Wor.) in turnips and swedes and the means of control, especially by plant breeding.—II, Further investigations and experiments in breeding resistant strains [trans. title], P. A. OLSSON (*Sveriges Utsädesför. Tidskr.*, 50 (1940), No. 6, pp. 287-360, figs. 15; *Eng. abs.*, pp. 352-360).

The use of boron in apple orchards, A. B. BURRELL. (Cornell Univ.). (*East. Fruit Grower*, 4 (1941), No. 1, pp. 5, 8, 17, 22, figs. 2).—This is a general discussion of the symptoms of B deficiency in apple trees and fruits and of experiments in New York State compared with such work in many widely separated countries, from which it is concluded that application of fine granular borax in a ring beneath the tips of the branches in early spring offers a cheap dependable method of preventing internal cork even in dry years. Though the method seems safe, it calls for more care in measuring and applying than is necessary for ordinary fertilizers. Since the tolerance of many other crops is not known, its general use should not be undertaken without specific advice.

Further experiments with ground spraying as an aid in apple scab control, G. W. KEITT and J. G. MOORE (*Wis. Hort.*, 31 (1941), No. 7, pp. 166-167).—A progress report on further tests in three widely separated Wisconsin orchards indicated that the method was about 98 percent effective in preventing ascospore discharge of leaves thoroughly wet by the spray, and that there was only about one-tenth as much scab in the treated as in the control orchards.

Delayed foliation of peach trees and spray injury, M. A. BLAKE (*N. J. State Hort. Soc. News*, 22 (1941), No. 3, pp. 1302, 1313, figs. 2).—This is a general

discussion of the relation between the condition of the leaves at the time they are sprayed to the amount of injury by such materials as S and arsenic, with notes on the backwardness of foliation correlated with unusually serious injury from the shuck-split application of a sulfur-lime-lead arsenate-zinc sulfate spray mixture. The injury was apparently a combined effect of arsenical and zinc sulfate.

Virus diseases of peaches, E. A. WALKER. (Univ. Md.). (*East. Fruit Grower*, 3 (1940), No. 10, pp. 8, 10-12, 14).—A brief conspectus referring to the three virus diseases of peach occurring in Maryland, viz, yellows, little-peach and red suture, and to nine others not yet reported from the State.

Parasites of *Eugenia jambos*: *Puccinia psidii* [trans. title], G. B. SCHOUTEN (*Rev. Agr. [Brasil]*, 15 (1940), No. 9-10, pp. 403-408, fig. 1).—A discussion of this rust of Malabar plum in Brazil.

White rot of the vine [trans. title], O. VERONA and G. MENCARINI (*Ann. Facoltà Agr. R. Univ. Pisa*, n. ser., 3 (1940), pp. 73-101, figs. 14; *Fr., Ger., Eng. abs.*, pp. 73-74).—The authors present a review (over two pages of references) and study of the white rot of grapes due to *Oenothyrium diplodiella*, including suggested control measures.

Further notes on fig mosaic, I. J. CONDET and W. T. HORNE. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 31 (1941), No. 6, pp. 561-563, figs. 2).—Since the previous paper on fig mosaic (*E. S. R.*, 71, p. 340), its occurrence has been noted in several other countries, but it apparently does not occur on "fig bushes" of the southeastern United States. Mosaic symptoms have also been observed on several species of *Ficus* in a collection at Riverside, Calif. The name *Fictivir caricae* is proposed for fig mosaic.

Avocado trunk cankers, W. T. HORNE, L. J. KLOTZ, and M. B. ROUNDS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 6, pp. 178-179).—The authors briefly review the types of cankers previously observed on avocado, report on a canker particularly serious on the Spinks variety, and summarize inoculation experiments indicating three species of *Phytophthora* (*P. citrophthora*, *P. cactorum*, and *P. cinnamomi*), and *Botryosphaeria ribis*, as all capable of infecting not only avocado but also walnut trees. The results with *P. citrophthora* confirm the early work of Fawcett (*E. S. R.*, 37, p. 555) and indicate that this type of canker still occurs and may be of importance.

Diseases of the banana plant [trans. title], J. DESLANDES ([*Brasil*] *Min. Agr., Dept. Nac. Prod. Veg., Serv. Defesa Sanit. Veg. Pub.* 10 (1938), pp. [1]+96, figs. 68).—This is an illustrated handbook briefly describing the plant, its species and varieties, and culture, and taking up in detail the diseases (and their control) of the roots and false stem, leaves, inflorescences, and banana cluster, and the diseases and injuries of the fruit after harvesting. One section is devoted to malformations. There is a bibliography of two pages.

Leaf spot and "Panama" disease or wilt of banana [trans. title], F. KERREAU (*Haiti Serv. Natl. Prod. Agr. et Enseig. Rural Bul.* 16 [1938], pp. 14-31, fig. 1).—A general discussion of these diseases, due, respectively, to *Cercospora musae* and *Fusarium oxysporum cubense* (= *F. cubense*), as they occur in Haiti, with suggested control.

Banana leaf spot investigations.—I, The basis of control, R. LEACH (*Jour. Jamaica Agr. Soc.*, 44 (1940), Nos. 11, pp. 454-457, fig. 1; 12, pp. 499-502).—In these studies of *Cercospora musae* leaf spot excellent control is reported from fungicidal spraying (e. g., bordeaux), which reduces the spore germination. Observations on the fungus and the disease symptoms are included.

Navel water rot takes toll (*Calif. Citrog.*, 26 (1941), No. 6, pp. 166-167, fig. 1).—Seasonal notes on navel oranges in California, with special reference to water rot in relation to rainfall and oil sprays.

Breeding a disease-resistant red climbing rose, H. R. ROSEN. (*Ark. Expt. Sta.*). (*Science*, 93 (1941), No. 2411, pp. 260-261).—The new hybrid named Stephen Foster and made available through responsible nurserymen is said to show relative freedom from mildew and low-temperature injury and to possess considerable vigor and fair degrees of tolerance to heat and drought.

Snapdragon rust-resistance trials, 1937-1938, C. O. BLODGETT and G. A. L. MEHLQUIST (*Hilgardia* [*California Sta.*], 13 (1941), No. 10, pp. 567-581).—No commercial variety as tested in two or more localities proved immune to *Puccinia antiirrhini*, but several were highly resistant. *Antiirrhinum asarina*, *A. chrysothales*, *A. glandulosum*, *A. maurandioides*, *A. orontium*, *A. ibanjestii*, and *A. siculum* were highly resistant but are so far removed taxonomically from *A. majus* as to raise doubts as to their breeding value. Of the two known forms of this rust, only the earlier reported one has yet appeared in the Sacramento Valley, and this is possibly confined to the coastal areas.

An outline for the diagnosis of shade tree trouble, D. S. WELCH. (Cornell Univ.). (*Arborist's News*, 6 (1941), No. 3, pp. 18-21).

The fight for the elms: Review of progress made in the campaign against the Dutch elm disease, E. G. BREWER (*Amer. Forests*, 47 (1941), No. 1, pp. 22-25, figs. 4).

Dutch elm disease eradication in 1940, E. G. REX (*Shade Tree*, 14 (1941), No. 1, pp. [8]).—A report of progress, including tabulations.

Tumors on elm and maple trees, N. A. BROWN. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 6, pp. 541-548, figs. 3).—Neither disease is rapidly spreading or dangerous, but either can badly disfigure the trees and eventually kill them. Repeated attempts at isolation failed to yield *Bacterium* (*Phytomonas*) *tumefaciens*, but a *Phomopsis* was obtained from the tumors on both hosts which proved capable of reproducing the disease. These fungus strains have not yet been assigned to any particular species.

The mycorrhizal fungi and mycorrhizae of four coniferous plantations in the Rhine Valley, W. D. THOMAS, JR. (Colo. State Col.). (*Phytopathology*, 31 (1941), No. 6, pp. 567-569).—Examination of four conifer plats near Karlsruhe for hymenomycetous mycorrhizal fungi and the tree roots in these plats for mycorrhizas revealed the fact that nearly all fungi observed appeared to support ectotrophic mycorrhizal formation. Although mycorrhizas were abundant on humus soils rich in mycorrhizal fungi, these soils without mycorrhizal fungi, as well as sandy soils, did not favor such growth. In the soils rich in mycorrhizal growth the general health and prospective yields of the stands were excellent.

White pine blister rust control—Michigan.—Annual Report, 1940, J. K. KROEBER ([*Lansing*]: *Mich. Dept. Agr.*, 1940, pp. [4]+33, figs. 3).—See previous reports (*E. S. R.*, 84, p. 488).

Oil injury to woodlands, S. C. CHANDLER and W. P. FLINT. (Ill. Expt. Sta. and Nat. Hist. Survey.). (*Arborist's News*, 6 (1941), No. 3, pp. 17-18).—Injury is reported from use of oil sprays to control the fruit tree leaf roller on shade and woodland trees.

Studies in the physiology of wood-destroying fungi.—III, Progress of decay under natural and under controlled conditions, W. P. K. FINDLAY (*Ann. Bot.* [London], n. ser., 4 (1940), No. 16, pp. 701-712, figs. 5).—White rot (*Polystictus versicolor*) completely destroyed inoculated samples of beechwood in 2 yr., but brown rots (*Coniophora cerebella*, *Merulius lacrymans*, and *Lenzites trabea*), which leave the lignin virtually unattacked, did not remove more than

about 70 percent of the wood substance. Preliminary rotting of beech with a white rot increased the subsequent rate of decay by a brown rot fungus. The significance of the results is discussed in relation to rotting of fallen timber and the supply of humus to a forest soil.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Investigation in economic zoology and entomology by the Alabama Station] (*Alabama Sta. Rpt. 1939, pp. 18-19, 39-41, 41-43*).—A report which notes progress (E. S. R., 84, p. 73) on varietal and specific differences in the resistance of vetches to aphid injury, by H. R. Albrecht; relative efficiency of rotenone-containing insecticides for the control of vegetable insects (Colorado potato beetle, Mexican bean beetle, velvetbean caterpillar, catalpa sphinx, harlequin bug, southern green stinkbug, turnip aphid, *Apanitesis phyllira* (Drury), pickleworm, and the melonworm), by F. S. Arant; insecticides for the control of the azalea lacebug *Stephanitis pyrioides* (Scott) and the azalea mealybug *Eriococcus azaleae* (Comst.), citrus insect control, and derris as a toxic supplement to oil emulsion for purple scale control, all by L. L. English, and farm fish ponds, by H. S. Swingle and E. V. Smith.

[Contributions on economic zoology and entomology] (*Kans. Acad. Sci. Trans., 43 (1940), pp. 243-290, 393-489, pls. 10, fig. 1*).—Among the contributions presented are the following: A Discussion of Hessian Fly Resistance in Certain Wheat Varieties, by E. T. Jones (pp. 243-265) (U. S. D. A.); Observations on Sod Webworms (*Crambus* spp., Lepidoptera) in Kansas, by H. D. Oliver Miller (pp. 267-281) (Kans. State Col.); Seasonal Variation in Resistance to High Temperature of the Cadelle and the Confused Flour Beetle, by H. H. Walkden (pp. 283-288), and Insect Infestation in Farm-Stored Grain in Kansas, by T. F. Winburn (pp. 289-290) (both U. S. D. A.); New Intermediate Hosts of Fowl Cestodes, by A. A. Case and J. E. Ackert (pp. 393-396) (Kans. Expt. Sta.); Artificial Evagination of Larval Tapeworms, by S. A. Edgar (pp. 397-399) (Kans. State Col.); Check-List of Kansas Birds, by W. S. Long (pp. 433-456); Notes on Hawk and Owl Pellet Formation and Identification, by E. L. Moon (pp. 457-466), and Identification of Rodents and Rabbits by Their Fecal Pellets, by J. Webb (pp. 479-481) (both Kans. State Col.); and The Effect of Various Disintegration Products of *Trichina* Tissue on the Developing Larvae of *Trichinella spiralis*, by M. D. Wheatley (pp. 483-489).

Transactions of the Fifth North American Wildlife Conference (*Washington, D. C.: Amer. Wildlife Inst., 1941, pp. VII+443, figs. [40]*).—The proceedings of the Fifth North American Wildlife Conference (E. S. R., 82, p. 214), held in Washington, D. C., March 1940, appear in two parts, the first containing the general sessions (pp. 1-120) and the second the special sessions (pp. 121-443). Contributions from the State experiment stations include Experiments on the Stocking of Fish Ponds, by H. S. Swingle and E. V. Smith (pp. 267-276) (Ala.); and Nesting Cover Used by Mearns Cottontail, by G. O. Hendrickson (pp. 328-331) (Iowa et al.). Among other contributions are: Ecological Classification of the Mammals and Birds of Walker County, Texas, and Some Adjoining Areas, by W. P. Taylor (pp. 170-176); Some Birds Naturalized in North America, by M. T. Cooke and P. Knappen (pp. 176-183); Relation of Franklin's Gull Colonies to Agriculture on the Great Plains, by P. A. Du Mont (pp. 183-189); The Influence of Birds on Local Grasshopper Outbreaks in California, by J. A. Neff and C. C. Wilson (pp. 189-195) (U. S. D. A. et al.); Bird Control—A Statement of Federal Policies With a Suggested Method of Approach, by E. R. Kalmbach and J. A. Neff (pp. 195-199); Environmental Improvement for Valuable Nongame Animals, by W. R. Van

Dersal (pp. 200-202) (U. S. D. A.); Cottontail Nesting-Study in Pennsylvania, by J. D. Beule (pp. 320-328) (Pa. State Col. et al.); A Study of Bobwhite Foods in Relation to Farm Problems in Northern Mississippi, by J. A. Johnson (pp. 337-343) (U. S. D. A.); The Hungarian and Chukar Partridges in Pennsylvania, by R. Gerstell (pp. 405-409); Possible Temperature Factors in North Central Pheasant Distribution, by R. Bennitt and H. V. Terrill (pp. 428-432) (Univ. Mo. et al.); and Wildlife Introductions in Alaska, by O. J. Murie (pp. 432-436).

Stratification, diurnal, and seasonal migration of the animals in a deciduous forest, R. H. ADAMS (*Ecol. Monog.*, 11 (1941), No. 2, pp. 189-227, figs. 16).

Planting of woody plants for food and shelter for wildlife, J. A. DeFRANCE (*Rhode Island Sta. Misc. Pub.* 9 (1941), pp. [1]+10).—A discussion based in part on Farmers' Bulletin 1719 (U. S. R., 71, p. 66).

Wildlife management through soil conservation on farms in the Northeast, F. C. EDMISTER (U. S. Dept. Agr., *Farmers' Bul.* 1868 (1941), pp. [2]+54, figs. 26).—Some of the possible ways of checking erosion and increasing wildlife in the 12 Northeastern States are considered in this practical account.

Mammals of Illinois: An annotated check list with keys and bibliography, W. L. NECKER and D. M. HATFIELD (*Bul. Chicago Acad. Sci.*, 6 (1941), No. 3, pp. [2]+17-60, figs. 15).—A bibliography of 53 titles is included.

Ecology of the coyote in the Yellowstone, A. MURIE (U. S. Dept. Int., *Natl. Park Serv., Fauna Ser. No. 4* (1940), pp. X+206, pl. 1, figs. [57]).—This account is accompanied by a bibliography of 24 titles.

Egg temperatures of wild birds under natural conditions, R. A. HUGGINS (*Ecology*, 22 (1941), No. 2, pp. 148-157, figs. 5).

Possible factors controlling length of incubation in birds, R. A. and S. E. HUGGINS (*Amer. Nat.*, 75 (1941), No. 758, pp. 282-285).

Feeding by turkey vultures at dens of the northern plains red fox [*Vulpes regalis*], T. G. SCOTT. (Iowa Expt. Sta. et al.). (*Ecology*, 22 (1941), No. 2 pp. 211-212).

Use of bile salts for the evagination of tapeworm cysts, S. A. EDGAR. (Kans. State Col.). (*Amer. Micros. Soc. Trans.*, 60 (1941), No. 1, pp. 121-128, figs. 6).—Description is given of a rapid method for evaginating *Cysticercus pisiformis* by means of commercial bile salts solutions and which may also be used for the evagination of other tapeworm larvae, *Multiceps serialis* and the cysticeroid of *Railletina cestitillus*.

Problems of insect speciation in the Hawaiian Islands, R. L. USINGER. (Univ. Calif.). (*Amer. Nat.*, 75 (1941), No. 758, pp. 251-263).

Further studies of the relative effects on insect metabolism of temperatures derived from constant and variable sources, T. J. HEADLEE. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 171-174, fig. 1).—Report is made of further studies of the relative effects of temperatures from constant and variable sources on insect metabolism (U. S. R., 83, p. 364), dealing in particular with the yellow fever mosquito under controlled variable temperatures and constants run at the average of the controlled variables. The results, the details of which are given in tables, have led to the conclusion that (1) the general conclusion set forth in the preceding paper that the relative effect on insect metabolism of temperatures drawn from variable and from constant sources is dependent upon where in the gamut of the insect's normal temperature reaction these constant and variable temperatures lie is confirmed; (2) the present work indicates that the underlying and governing factor of such differences as exist in the variable and constant temperatures is the accumulation of

the required amount of temperature, regardless of whether the temperatures in question come from constant or variable sources.

The influence of colchicine upon the germ cells of insects (Orthoptera), with special reference to the mitochondria and dictyosomes, T. P. DOOLEY (*Amer. Micros. Soc. Trans.*, 60 (1941), No. 1, pp. 105-119, figs. 30).

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1940, ET-158, pp. 4, pls. 3; ET-159, pp. 6, pls. 4; ET-160, pp. 4, pls. 3; ET-161, pp. 5, pls. 3; ET-162, pp. 4, pls. 2; ET-163, pp. 6, pls. 6; ET-164, pp. 3, pls. 2).—Further contributions (E. S. R., 83, p. 83) are A Technique for the Recovery of Very Small Dead Insects in Mortality Experiments, by F. R. Lawson (ET-158); Temperature-Humidity Controlled Cabinets for the Study of Insects, by P. N. Annand and F. H. Harries (ET-159); A System of Classifying Cabbage According to the Extent of Caterpillar Injury, by W. J. Reid, Jr. (ET-160) (coop. S. C. Expt. Sta.); A Rearing Method for the Mass Production of *Microplectron fuscipennis* (Zett.), Cocoon Parasite of the European Spruce Sawfly *Gilpinia polytoma* (Htg.), by F. E. Miller, Jr. (ET-161); Construction of a Hair-Hygrostat With Magnetic Switch for Humidity Control in an Incubator Room, by K. D. Arbuthnot (ET-162); A Mechanical Trap for the Sampling of Aerial Insect Populations, by J. C. Chamberlin and F. R. Lawson (ET-163); and Two Convenient and Easily Stored Knock-Down Cages for Laboratory and Field Studies, by J. M. Wagner and R. A. Blanchard (ET-164).

Insect pests of farm, garden, and orchard, L. M. TEAIRS (*New York: John Wiley & Sons; London: Chapman & Hall*, 1941, 4. ed., pp. XVII+549, figs. 648).—This is a revised edition of the work noted (E. S. R., 67, p. 149).

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1940, E-515, pp. 6, pl. 1; E-516, pp. 90; E-517, pp. 25; E-519, pp. 5, pl. 1; 1941, E-520, pp. 8, pls. 2; E-521, pp. 20; E-523, pp. 3, pl. 1; E-524, pp. 5; E-525, pp. 12, pls. 2; E-526, pp. 31; E-527, pp. 4; E-528, pp. 20; E-529, pp. 13, pl. 1; E-530, pp. 6; E-531, pp. 7, pls. 5; E-532, pp. 6, pls. 2; E-533, pp. 5, pls. 2; E-534, pp. 6, pl. 1; E-535, pp. 5, pls. 2; E-536, pp. 7, pls. 2; E-537, pp. 55; E-538, pp. 5; E-539, pp. 48; E-540, pp. 4).—The following contributions are in continuation of this series (E. S. R., 84, p. 493): The Effectiveness of Concentrated Sprays in the Control of Certain Forest Insects, by S. F. Potts (E-515); The Work of the Division of Insecticide Investigations, 1927-1939 (E-516); Conversion Tables and Equivalents for Use in Work Relating to Insect Control, by R. H. Nelson (E-517); Control of the Pale Western Cutworm in the Southern Great Plains Region, by H. H. Walkden (E-519); Ranch Management for Screwworm Prevention and Eradication in Texas and Adjoining States, by D. C. Parman and W. L. Barrett, Jr. (E-520); Methyl Bromide Fumigation of Imported Perishable Food Products, by R. Latta (E-521); Controlling Grubs of the Southern Green June Beetle in Lawns, by W. R. Walton (E-523); Insect Enemies of House Plants and Their Control, by G. V. Johnson (E-524); The Use of Oil or Oil Containing Insecticides for Earworm Control in Sweet Corn, by G. W. Barber (E-525), which supersedes E-497 (E. S. R., 84, p. 493); Methyl Bromide Fumigation of Greenhouse Plants at the U. S. Plant Introduction Garden, Glenn Dale, Md., by R. Latta and W. H. Cowgill (E-526); The Raisin Moth on Grapes, by G. H. Kaloostian, D. F. Barnes, C. K. Fisher, and P. Simmons (E-527); Insects and Spiders Found in Spanish Moss, Gin Trash, and Woods Trash and on Wild Cotton, by C. F. Rainwater (E-528); Some Effects of Temperature, Relative Humidity, Confinement, and Type of Food on Queen Bees in Mating Cages, by A. W. Woodrow (E-529) (coop. Univ. Wyo.); Contact Insecticides for Chinch Bug

Control on Corn, by E. V. Walter and C. Benton (E-530); The Use of Pollen Traps and Pollen Supplements in Developing Honeybee Colonies, by C. W. Schaefer and C. L. Farrar (E-531) (coop. Univ. Wis.); The Potato and Tomato Psyllid, by R. L. Wallis (E-532); Cotton Root Aphids and Their Control, by C. F. Rainwater (E-533); Steam Treatment of Orchard Boxes to Destroy Codling Moth Larvae, by F. P. Dean and E. J. Newcomer (E-534); *Parlatoria chinensis* Marlatt, a Scale Insect Recently Discovered in the United States (E-535); The Role of Pollen in the Economy of the Hive, by F. E. Todd and R. K. Bishop (E-536) (coop. Univ. Calif.); A Review of Information on Anabasine, by R. C. Roark (E-537); Dusting for Boll Weevil and Cotton Aphid Control, by F. F. Bondy and C. F. Rainwater (E-538); A Second List of Organic Sulfur Compounds Used as Insecticides, by D. L. Vivian and F. Acree, Jr. (E-539) (E. S. R., 73, p. 507); and A New Remedy for the Prevention and Treatment of Screwworm Infestations of Livestock, by R. Melvin, C. L. Smith, H. E. Parish, and W. L. Barrett, Jr. (E-540).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 179, 216, 255, 317-326, figs. 4).—Contributions presented (E. S. R. 85, p. 217) are: Maintaining Live Chinch Bugs for Laboratory Use, by P. C. Stone (p. 179) (Univ. Mo.); Flesh Fly [*Wohlfahrtia opaca* (Coq.)] Kills Kit Mink, by G. F. Knowlton and D. G. Hall (p. 216) (Utah Expt. Sta. and U. S. D. A.); Oviposition of the Omnivorous Leaf-Tier [Strawberry fruitworm], by R. G. Rosenstiel (p. 255) (Oreg. State Col.); Rearing Blowflies in the Laboratory, by H. Frings (p. 317) (Univ. Minn.); Lures for the Walnut Husk Fly, by A. M. Boyce and B. R. Bartlett (p. 318) (Calif. Citrus Sta.); Transparencies for Certain Insect and Plant Materials, by S. W. Frost (p. 319) (Pa. State Col.); A Convenient Mount for Insects, by H. S. Telford (p. 320) (N. Dak. Agr. Col.); Screwworms in Man in Missouri (p. 320) and A New Grape Insect [*Rhabdopterus praetexta* (Say)] in Missouri (p. 321), both by G. D. Jones (both Univ. Mo.); Metaldehyde and Calcium Arsenate in Slug and Snail Baits, by W. H. Lange, Jr., and G. F. McLeod (pp. 321-322) (Calif. Sta.); A New Leaf Roller on Strawberry [*Amelia* (*Tortrix*) *pallorana* (Rob.)], by W. W. Smith (p. 323) (Univ. Mo.); Control of the Common Red Spider on Cotton, by D. Isely (pp. 323-324) (Univ. Ark.); A New Method of Counting Orchard Mites, by E. P. Venables and A. A. Dennys (p. 324); The Klamath Midge [*Chironomus utahensis*], by D. E. Bonnell and D. C. Mote (p. 325) (Oreg. State Col.); Control of the Corn Earworm on Broccoli, by H. G. Walker and L. D. Anderson (pp. 325-326) (Va. Truck Sta.); and Boxelder Bug Feeding Habits, by G. F. Knowlton (p. 326) (Utah Sta.).

[Notes on economic entomology] (*Miss. Farm Res.* [Mississippi Sta.], 4 (1941), Nos. 3, pp. 1, 7, 8; 5, pp. 1, 2, 8).—The following articles are included:

No. 3.—Suggestions for Beginners in Beekeeping—Equipment Needed, by C. Lyle (pp. 1, 7); "Green Bug" Injury to Oats Unusual, Not Likely To Recur, by C. Lyle (p. 7); and Insecticides for Flower Garden and Greenhouse Pests, by S. H. Coleman and C. Lyle (p. 8).

No. 5.—Zinc-Safened Calcium Arsenate Controls Aphids, Weevils in Preliminary Test (pp. 1, 2) and Sprays, Dusts, and Baits for Control of Garden Insects (p. 8), both by C. Lyle.

Entomology, (*Tennessee Sta. Rpt. 1939*, pp. 48-50).—In this report of work conducted by S. Marcovitch during the year (E. S. R., 83, p. 519) brief reference is made to the plum curculio, tobacco hornworm, control of the corn earworm on lima beans by cryolite, insecticide deposit required for control of insects, and the more important insects of the year (grape leaf folder, tobacco flea beetle, and the southern cabbageworm).

[Entomological investigations by the Washington Station]. (Partly coop. U. S. D. A.). (*Washington Sta. Bul.* 394 (1940), pp. 31-32, 42-47, 99, 103, 104-105).—A progress report (E. S. R., 83, p. 217) which includes information on the chemistry of insecticides, by K. Groves; sprays for codling moth, by Groves and H. Fallscheer; lead arsenate substitutes for codling moth and other apple pests, comparison of insecticidal values of dry and liquid lime-sulfurs, and light traps as an accessory measure in codling moth control, all by R. L. Webster and W. J. O'Neill; tomato fruitworm control, by Webster and R. D. Eichmann; control of five orchard mites affecting fruit trees, by Webster, O'Neill, and I. M. Newell; life history and control of the cherry fruitworm, by E. P. Breakey and Webster; onion thrips as pests of greenhouse carnations, by Eichmann; the asparagus beetle and the asparagus miner, both by Webster and Eichmann; factors influencing the efficiency of spray protection on the surface of growing apples, by Webster, O'Neill, and Fallscheer; biology and control of the potato flea beetle, by Webster and H. H. Dodge; wireworm investigations, by M. C. Lane, R. S. Lehmann, and K. E. Gibson; and studies at the Cranberry-Blueberry Substation which dealt with dormant sprays for scale insects, fireworm sprays, fruitworm, and root weevils (black vine weevil and strawberry root weevil), by D. J. Crowley.

[Entomological work by the Western Washington Station] (*Western Washington Sta. Rpt.* 1940, pp. 24-28).—A progress report (E. S. R., 83, p. 217) which mentions the following research: Life history and control of the cherry fruitworm in western Washington, by E. P. Breakey and R. L. Webster; holly insects (the holly bud moth *Rhopobota naevana ilicifolia* Hbn. and the soft scale) and their control, the effect of the solvent on rotenone in solution, and studies on the strawberry root weevil, all by Breakey; the resistance of sweet corn to corn earworm attack, by Breakey et al.; control of the pear thrips, by Breakey, G. A. Huber, and K. E. Baur; and pyrethrum as a crop in western Washington, by M. S. Grunder and Breakey.

[Work in economic entomology by the Wisconsin Station]. (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul.* 451 (1941), pp. 37-51, figs. 6).—The work of the year reported upon (E. S. R., 83, p. 364) includes a study of the cabbage curculio, by C. L. Fluke; control of the striped cucumber beetle and squash bug on cucurbit crops, by T. C. Allen and J. W. Brooks; white grubs in legumes, by T. R. Chamberlin, L. Seaton, Fluke, and J. A. Callenbach; the corn leaf aphid, by E. M. Searls and P. Hoppe; phenoxychloroethyl ether an effective fly repellent, by Searls and R. Daehuert; tests with transparent films for the protection of foods against insects, by Fluke; better dormant sprays in the form of new insecticides containing "dinitro" or "DN" materials and the black cherry aphid, both by J. H. Lilly; the fruit tree leaf roller and the necessity for correct timing of codling moth sprays, both by Callenbach; recommended spray programs keep residues on apples low, by Lilly and Callenbach; "charged" dusts make best aphid insecticides, by H. F. Wilson, C. E. Dieter, and H. L. Burdick; field experiments with pea aphid insecticides, by Wilson and Dieter; experiments with airplane dusting of peas; the pea aphid population of 1940; migration of pea aphids on foot, by Searls; and alkaline carriers tend to destroy rotenone, by Brooks and Allen.

The use of petroleum oils as insecticides, I, II, G. W. PEARCE, A. W. AVENS, and P. J. CHAPMAN. (N. Y. State Expt. Sta.) (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 202-212, figs. 5).—This work is presented in two parts.

I. Determination of the amount of oil deposited on apple bark in dormant spraying (pp. 202-206).—A description is given of a method for determining the amount of petroleum oil deposited on apple bark by dormant sprays.

Typical results obtained when the method was applied to field experiments are presented. On the basis of a large number of replicated analyses of samples taken from field tests, it was determined that the probable error of a single determination is ± 5 percent. A discussion of the errors involved in the method is given.

II. *Some factors affecting the amount of oil deposited on apple bark in dormant spraying* (pp. 207-212).—The three factors which are probably most important in affecting the amount of oil deposited on apple bark in the dormant treatment of apple trees are (1) concentration of oil in the spray mixture, (2) kind and amount of emulsifier-wetting agent used, and (3) the quantity of spray applied to the tree. In general, the expected correlation between oil concentration and deposition is maintained within limits where the same emulsifier is used.

Potassium soaps of a wood rosin and rosin residue as spreaders for nicotine, derris, and pyrethrum in horticultural sprays, W. W. FASSIE and R. L. PIERPONT. (Del. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 200-202).—Tests with potassium soap of FF wood rosin and potassium soap of rosin residue as spreaders for nicotine, derris, and pyrethrum, which included potassium oleate soap as the standard for comparison, showed that combinations of nicotine with any of these soaps were more effective than either nicotine alone or derris and pyrethrum alone, or in combination with these soaps, for control of the bean aphid or the spirea sphid *Aphis spiraeicola* Patch. The potassium soaps of FF wood rosin and rosin residue were as satisfactory as spreaders for nicotine as potassium oleate soap, but the latter was definitely a better spreader for derris than either.

Simplified instructions for control of cotton insects, F. L. THOMAS (*Texas Sta. Cir.* 92 (1941), pp. 4).—A practical account dealing with the cotton flea hopper, bollweevil, and cotton bollworm

Further studies of various insecticides against three cotton insects, G. L. SMITH, A. L. SCALES, and R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 310-313).—Cage tests conducted at Tallulah, La., in 1939, in which several arsenicals and cryolites were used against the bollweevil and the cotton leaf worm and derris, pyrethrum, sulfur, and calcium arsenate-sulfur mixtures against the tarnished plant bug, are reported. "With calcium arsenates that had been separated into fractions according to particle size, definite correlations were shown between particle size and percentage of water-soluble arsenic pentoxide as determined by the New York method, between particle size and net bollweevil mortality, and between percentage of water-soluble arsenic pentoxide and net mortality. Calcium arsenate was more effective against the bollweevil and the cotton leaf worm than cryolite with or without wetting agents. Dicalcium arsenate gave better results than commercial calcium arsenates, calcium arsenate-sulfur mixtures, or basic copper arsenate. The addition of wetting agents to calcium arsenate and to cryolite did not significantly affect mortality. Calcium carbonate and sulfur appeared to be better carriers for calcium arsenate than lime. Against adults of the tarnished plant bug, calcium arsenate-sulfur mixtures caused a higher mortality than sulfur alone. There was no significant difference in effectiveness between derris and pyrethrum, but both were more effective than calcium arsenate-sulfur mixtures."

Combinations of insecticides for control of boll weevil and cotton leaf aphid, C. F. RAINWATER and F. F. BONDY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 297-300).—In comparative tests conducted near Florence, S. C., in 1939, in which several insecticides and combinations of insecticides

were employed in the control of the cotton bollweevil and cotton leaf aphid, "calcium arsenate, mixtures of equal parts of calcium arsenate and two fixed-nicotine dusts, and barium fluosilicate plus derris (to give a rotenone content of 0.5 percent) were significantly better than two of the three cryolites tested with or without the addition of derris for bollweevil control, when based on average seasonal infestation. Yield records and boll counts did not show significant differences between treatments. The cryolites and barium fluosilicate with derris were inferior to calcium arsenate in dusting qualities but were followed by aphid populations of only 12 to 24 percent of those with calcium arsenate. Equal parts of calcium arsenate and fixed-nicotine dusts held the aphid population to approximately 50 percent of that in the undiluted calcium arsenate treatments. Equal parts of calcium arsenate and sulfur, or of calcium arsenate and diatomaceous earth, with the addition of derris gave satisfactory bollweevil control and kept the aphid population equal to or below that of the checks."

A review of entomological research on potato insects, W. A. RAWLINS. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 4, pp. 112-116).

Control of fruit insects with parasites, C. H. ALLEN (*Tenn. State Hort. Soc. Proc.*, 35-36 (1939-40), pp. 59-62).

Insect pests of the peach in the Eastern States, O. I. SNAPP (*U. S. Dept. Agr., Farmers' Bul.* 1861 (1941), pp. 11+34, figs. 22).—This publication, based largely on Farmers' Bulletin 1537 (E. S. R., 59, p. 759), which it supersedes, contains information on the plum curculio, the peach borer, the San Jose scale, the oriental fruit moth, and certain other insects injurious to peaches east of the Rocky Mountains. Available methods of control for these pests in the area are presented.

Major shade tree insects of 1940, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 180-181).

Some troublesome pests of conifers, J. S. HOUSER. (Ohio. Expt. Sta.). (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 65-83, figs. 5).

The use of methyl bromide as a mill fumigant, R. T. COTTON, G. B. WAGNER, and T. F. WINBURN. (U. S. D. A.). (*Amer. Miller*, 69 (1941), No. 1, pp. 105-106).—A report of work with methyl bromide as a mill fumigant, in which both the advantages and disadvantages of its use are summarized.

Field infestation by insects that injure rice in storage, W. A. DOUGLAS (*U. S. Dept. Agr. Cir.* 602 (1941), pp. 8, fig. 1).—At least 25 insect species attack stored rice or rice products, and 8 of these cause serious losses. This investigation demonstrated that the chief sources of field infestations of rice by insects attacking it in storage are storage warehouses, strawstacks, and corn and sorghum fields. As many as 100,000 rice insects may be contained per ton of straw in rice strawstacks. Apparently no variety of rice is significantly resistant to insects that attack stored rice. The usual insect population found in seed rice does not affect germination. It is suggested that the number of insects taken into warehouses from fields can be reduced by cleaning warehouses thoroughly and disposing of old grain before the new crop of rice heads, spreading strawstacks or burning them by the end of May, and avoiding the planting of corn or sorghum near rice fields.

Protecting stored wheat against insects, F. A. FANTON (*Oklahoma Sta. Cir.* 95 (1941), pp. 8, figs. 4).—A practical account.

Life histories and habits of some grasshoppers of economic importance on the Great Plains, R. L. SHOTWELL (*U. S. Dept. Agr., Tech. Bul.* 714 (1941), pp. 48, pls. 10, figs. 12).—Field and laboratory studies of the life history, habits, economic importance, and the relation of temperature to development and activ-

ities of the two-striped grasshopper, the differential grasshopper, and 10 other economic species of grasshoppers are included. Between 68° and 104° F., there is a high correlation between temperature and increased rate of development and amount of activity. Roughly from 70° to 90° is the range of optimum ground activity. Grasshoppers feed sparingly on sorghums, prefer small grains, corn silk, and young shoots of corn and alfalfa, but attack most tree and shrub bark and foliage except green ash. Hatching and oviposition periods are the most important in the seasonal history and vary from year to year, the former often extending over 6 weeks. Low soil temperatures and lack of moisture retard hatching, which occurs only at soil temperatures about 60° under moist conditions. External structural changes for the fifth and sixth instar development shown by most species are best indicated by the development of the wing pads, which point dorsally only in the last two instars and ventrally otherwise.

The alfalfa plant bug *Adelphocoris lineolatus* (Goeze) found in Arkansas, C. CURTISS. (Kans. State Col.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 1, pp. 25-26).

The effect of the green grain bug upon the milling and baking quality of wheat, R. H. HARRIS, L. D. SIBBERT, J. A. MUNRO, and H. S. TELFORD (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 5, pp. 10-14, figs. 2).—Tests showed that *Chlorochroa uhleri* Stål. reduced the acre yield and grade of the wheat crop, which it attacks, as well as seriously damaged the milling and baking qualities of the grain. A table showing the resistance of 13 varieties indicates that susceptibility to injury may be linked with wheat variety.

Plant food and mealybug injury, W. J. SCHOENE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 271-274).—The finding that Comstock's mealybug does not injure unfertilized trees, that even in orchards receiving nitrogen severe damage is often limited to only a small portion of the total area, that there is very little injury to the fruit of young bearing orchards, and that young trees escape injury, led to the study reported. It was found that all the severely injured orchards were mature, the trees ranging in age from 25 to 60 yr., and had received annual applications of nitrogenous fertilizer for a number of years. "We have ample information regarding the fertilizer requirements of Virginia soils for the production of farm crops, but there are no data regarding the needs of an old orchard in a high state of productivity. Since the fruit in the old mealybug-infested orchards failed to color properly and since the failure of the fruit to color has been definitely associated with nitrogen in excess of potash, it is believed that there is a slight potash deficiency in these orchards. . . . A high nitrogen ratio tends to prolong the growing season of the tree, delays the coloring of the fruit, reduces the potash in the fruit, and, in extreme cases, affects the sugar content and the keeping quality of the fruit. The high nitrogen ratio also apparently promotes a type of growth that is very favorable to the mealybug. These statements are substantiated by the fact that in two orchards mealybug injury disappeared in 2 yr. after the nitrogen applications had been omitted."

New species of Pseudococcidae, H. S. MCCONNELL. (Md. Expt. Sta.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 5, pp. 93-105, figs. 5).—Five species are described as new, namely, *Pseudantonina arundinariae*, from South Carolina; *Pseudococcus diodium* and *P. junceus*, the former from South Carolina and the latter from Maryland; and *Trionymus caricis* and *T. cladestinis* from Maryland.

Scale infestations on citrus during 1940, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 22 (1941), No. 2, pp. 5, 8-9, 16-17, figs. 3).

The toxicity and repellent action of some derivatives of picramic acid and of toluenesulfonyl chloride to the greenhouse leaf tier, R. L. METCALF and C. W. KEARNS. (Univ. Ill.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 306-309).—The results of tests of 27 organic chemical compounds, derivatives of toluenesulfonyl chloride and of picramic acid, as stomach poisons for the greenhouse leaf tier are reported upon, the details being given in table form. They were evaluated from the relative areas eaten out of leaf disks dusted with accurately weighed amounts of pure chemical compounds in a modified Campbell (E. R. S., 62, p. 648) dusting tower. Of the compounds tested, 9 gave results superior to acid lead arsenate. The most toxic compound studied was N,N-methylpicramic acid. Several interesting generalizations concerning the relationship of molecular structure to toxicity in this series of compounds have been made.

The sugar-beet webworm in Montana, J. H. PEPPER and E. B. HASTINGS (*Montana Sta. Cir.* 162 (1941), pp. 8, figs. 6).—A popular account.

Codling moth control studies in 1940, S. W. HARMAN and D. E. GREENWOOD. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 268-270).—The findings reported indicate that a substantial reduction should be possible in the amount of oil ordinarily used in summer codling moth sprays with but little sacrifice in efficiency. Such a reduction would be important not only from the standpoint of economy but also because the more dilute sprays should be appreciably less toxic to the trees, more compatible with fungicides, and less likely to detract from the appearance of the fruit at harvest.

Experiments with chemicals on codling moth larvae in the dormant season, J. M. GINSBURG. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 263-268).—The results of laboratory and orchard experiments conducted with various organic chemicals on codling moth larvae and pupae are reported, the details being given in tables. In the laboratory, larvae hibernating in corrugated papers as well as in bark removed from Rome trees were employed for the tests. In the orchard, trunks and main limbs of several varieties of apple trees infested with codling moth larvae were sprayed in early spring. "The results indicate that dichloroethyl ether possesses high toxicity to codling moth larvae in concentrations of 0.75 percent or higher under laboratory conditions but failed to produce significant kill in the orchard, primarily due to lack of penetration. Kerosene, the cheapest solvent tested, in concentration of 17 percent or higher killed from 93 to 100 of the larvae both on the tree and in the laboratory experiments. No injury resulted to the apple tree from kerosene spray mixtures when applied in the early spring. Distinct injury occurred to the bark from concentrated kerosene sprays applied during the growing season."

Lead arsenate "dynamite" codling moth sprays in Pennsylvania, H. N. WORTHLEY and H. M. STEINER. (Pa. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 256-263).—Field tests extending over a 4-yr. period commencing in 1937 with so-called dynamite or inverted spray mixtures, in which the particles of solid toxicant are preferentially wetted by oil and thus stick to the sprayed surface, are reported. "In over-spraying the run-off continues to consist largely of water, and deposits can be built up to high levels. With one such inverted lead arsenate spray timed as a second cover, carrying double the usual concentration of lead arsenate and applied at double the usual quantity per tree, control of first-brood codling moth larvae has equalled that obtained with standard schedules of four or five lead arsenate cover sprays. In general, the problems of residue removal, apple scab control, and spray injury have not been complicated by the use of dynamite sprays in June. Results suggest the desirability of later applications in years of codling moth abundance in orchards subject to reinfestation from adjacent plantings. Successful schedules of

inverted sprays have saved about one-fifth the cost of the usual schedule of four cover sprays."

The oriental fruit moth in Missouri, C. W. WINGO (*Missouri Sta. Bul.* 424 (1941), pp. 15, figs. 6).—This insect has been a major peach pest in Missouri for the past 10 yr. Heavy damage by it has been generally confined to the southern and eastern portions of the State. Five generations occur annually. Thirteen species of larval parasites have been found in Missouri. As a result of 3 years' experimental spraying and dusting tests, indications are that oil-sulfur dusts and oil-nicotine sprays will materially increase the amount of clean fruit at harvest, and recommendations for these, as well as fixed nicotine, are included.

A large-scale test of dusts to control the European corn borer, N. TURNER (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 284-287).—A field experiment was conducted at New Haven in 1940 on early sweet corn planted about April 15. One area was dusted with commercial dual-fixed nicotine dust containing 4 percent of nicotine, supposedly a mixture of 25 percent nicotine tannate dried, reground, and mixed with 75 percent powdered nicotine bentonite and diluted with a suitable inert carrier. On the other area, a commercial rotenone dust containing 1 percent rotenone in pure derris root and diluted with Bancroft clay was used. The results, the details of which are given in tables, show that the dual-fixed nicotine dust was more effective in producing borer-free ears than was rotenone dust. In spite of lower cost per acre for rotenone dust and higher returns in this experiment, it is believed that dual-fixed nicotine dust is distinctly preferable. Although the cost of treatment was relatively high, substantial profits were made as a result of dusting. It is considered evident that insecticidal control of the European corn borer in early sweet corn in Connecticut is commercially practicable and profitable under present conditions.

The performance of hybrid field corns under European corn borer conditions in New Jersey, B. B. PEPPER and C. S. GARRISON. (*N. J. Expt. Stas.*). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 281-284).—In field experiments and hand-infested plats in which eight hybrids and open-pollinated varieties of field corn were compared in relation to European corn borer populations at harvest, it was clearly demonstrated that N. J. Hybrid No. 2 showed a definite resistance to the European corn borer. "Hybrid R.×Hy also shows some resistance under New Jersey conditions, while A×Tr is not adapted to studies of this kind. N. J. Hybrid No. 4 does not show the same degree of borer resistance as No. 2 and R.×Hy, but the large stalk of No. 4 can tolerate a certain number of borers without a marked reduction in yield. For some reason moths appear to prefer other hybrids and varieties to N. J. Hybrid No. 2 for egg deposition. There is a definite correlation between stem hardness and the borer population in the different corns studied."

Hatching response of *Aedes sollicitans* eggs under selected and controlled environmental conditions, W. A. CONNELL. (*Del. Expt. Sta.*). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 187-192, figs. 2).—Report is made of the results of a study undertaken to determine the hatching response of the eggs of the salt-marsh mosquito to plant infusions, distilled water, creek water, and sodium chloride solutions. An attempt was also made to determine the relationship between the age of the eggs and their ability to hatch, as well as the effect on the hatching process of continuous submergence and submergence alternating with periods of exposure to air.

The nutrition of mosquito larvae, A. R. BUDDINGTON (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 275-281).—In nutrition experiments with mosquito larvae, autoclaved and Berkefeld W-filtered pond water was found to support the

growth of the larvae of the yellow fever mosquito and the northern house mosquito only as far as the fourth instar. "*Escherichia coli* fails to support the growth of the larvae to maturity, but *Bacillus subtilis* and *Saccharomyces cerevisiae* support the growth of larvae to maturity. Mosquito larvae develop under sterile conditions to maturity on alcohol-sterilized yeast, but cannot develop beyond the fourth instar on autoclaved yeast. The heat-stable factor of yeast is also present in autoclaved liver concentrate. Nicotinic acid and ascorbic acid do not replace the heat-stable factor in yeast. Mosquito larvae fail to develop beyond the fourth instar on a solute diet containing amino acids, vitamins, glucose, and Osborne-Mendel salts. Mosquito larvae require for development to maturity under aseptic conditions at least three factors: Thiamin hydrochloride (B_1), riboflavin (B_2), and a heat-stable factor in yeast and liver extract."

Comparative density of mosquitoes at ground level and at an elevation of approximately one hundred feet, D. MACCREARY. (Del. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 174-179, fig. 1).—Report is made of work conducted at two lighthouse towers with a view to obtaining quantitative data on mosquito abundance within the so-called "terrestrial" zone of the atmosphere, which is considered to extend upward 150 or 200 ft. 'New Jersey (vertical model) mosquito traps were operated in pairs, one between 4 and 5 ft. above ground and the other at an elevation of 80 or more feet . . . At the Marcus Hook Rear Light, the mosquito fauna was composed largely of fresh-water forms, while at the Fenwick Island Lighthouse, the mosquitoes were predominantly salt marsh in origin. At the first location, the high level trap was 103 ft. above the ground. The lower trap collected 2,546 females distributed among 15 species in 54 nights of operation, while the upper trap collected 10 species and but 87 females during the same interval [3.3 percent]. . . . On 42 nights, females were collected in the lower trap, while the upper trap caught females on only 26 nights. Females in excess of 100 were taken on 9 nights in the lower trap. At Fenwick Island, the lower trap captured 14,325 female mosquitoes representing 15 species, while the higher trap collected 1,334 females distributed among 11 species [8.5 percent]. . . . During 60 nights of operation the lower trap collected females each night, while the upper trap took females on only 43 nights. Twenty-four or more mosquitoes were taken during 49 and 12 nights in the lower and upper traps, respectively. On 35 nights, the lower trap collected more than 100 females, while the upper trap exceeded this number on but four occasions."

Agents for increasing the toxicity of pyrethrum to mosquito larvae and pupae, R. L. MENTZER, F. C. DAIGH, and W. A. CONNELL. (Del. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 182-186, fig. 1).—"Five modifications of the 'New Jersey Mosquito Larvicide' were compared with the standard formula (substituting No. 2 fuel oil for kerosene, a common practice) to determine whether or not the addition of either Yarmor Pine Oil, D. H. S. Activator, or Thanite would increase the toxicity of the pyrethrum contained in such a spray to mosquito larvae and pupae. The results of laboratory tests with three species of mosquitoes, *Culex pipiens*, *Aedes vexans*, and *A. sollicitans*, and of field tests with the species last named show that, when any of these naval stores products are added to or replace a part of the pyrethrum contained in the standard formula, a larvicide is produced which is more effective than the original. From the standpoints of both toxicity and cost, the oil emulsion containing 50 percent as much pyrethrum as is included in the standard, but with 5 percent D. H. S. Activator added, when used at the recommended 1:10 dilution was definitely the most satisfactory spray tested. Other combinations showed

considerable promise. No harmful effect was noted on either killifish or vegetation from the application of any of these larvicides."

Egg production of Greek anophelines in nature, R. C. SHANNON and J. HADJINICOLAOS (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 300-305).

The use of chlorinated benzenes for the control of aquatic midges, H. L. FELLTON (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 192-194, fig. 1).—The promising results of laboratory tests and a field trial with orthodichlorobenzene and trichlorobenzene led to their use in two lakes within an exposition area for the control of *Procladius* and *Chironomus* midges breeding heavily therein. "By means of specially constructed spraying outfits mounted in small boats, these materials, used separately, were applied as a fine spray under the surface of the water. Five treatments, at approximately monthly intervals, were made during the breeding season, the first three with orthodichlorobenzene at rates of 25, 22, and 21 gal. per acre, respectively, and the last two with trichlorobenzene at the rate of 16 gal. per acre. Under the conditions encountered, the use of these chlorinated benzenes resulted in effective control."

The robber flies of Colorado (Diptera: Asilidae), M. T. JAMES. (Colo. State Col.). (*Jour. Kans. Ent. Soc.*, 14 (1941), Nos. 1, pp. 27-36; 2, pp. 37-53).

A new nearctic species of Exopaltus (Tachinidae: Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 2, pp. 58-60).

The introduction and establishment in Cuba of Metagonistylum minense, parasite of the sugar cane borer, L. C. SCARAMUZZA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 13 (1939) pp. 295-298, fig. 1).

Control of cranberry fruit worm on blueberries, C. S. BECKWITH. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 169-171).—In control work with the cranberry fruitworm, an important pest of the blueberry, two airplane dustings, each of 30 lb. of pyrethrum per acre, the first on May 29 and the second on June 6, reduced the number of worms crawling on the harvested fruit by 94 percent.

The genus Ectecephala in North America (Diptera: Chloropidae), C. W. SABROSKY. (Mich. Expt. Sta.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 4, pp. 75-80).—Of the four species of Diptera and the genus *Ectecephala* noted, one is described as new to science under the name *E. sulcata*.

Effect of a terpene ether on certain fly sprays, R. L. PIERPONT. (Del. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 195-197, fig. 1).—Information on a spray consisting of pyrethrum, Lethane 384 Special, and D. H. S. Activator, here presented, supplements that previously noted (E. S. R., 81, p. 673), the details being given in table form. It was found that these three materials were compatible in Deobase. "The efficiency of fly sprays containing varying percentages (1, 2, or 3) of pyrethrum and Lethane 384 Special was increased by the addition of D. H. S. Activator. Increased toxicity was due to the activation of the pyrethrum by D. H. S. Activator. In every case, the increases obtained by the addition of 5 percent of this material were greater than those obtained with the 3-percent concentrations. D. H. S. Activator apparently has no effect on straight Lethane 384 Special sprays, since no appreciable increase or decrease in toxicity attributable to D. H. S. Activator was noted when this material was added to such sprays. Combination sprays including all three materials proved effective against the housefly, with the degree of efficiency correlated with the amounts of the several materials contained in the sprays."

Toxicity of certain chemicals to the fleece worms Phormia regina (Meig.), Cochliomyia macellaria (F.), and Lucilia sericata (Meig.), E. F.

KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 314-317).—Tests of the minimum lethal concentration of 30 organic and 7 inorganic chemicals to larvae of *P. regina*, the secondary screwworm, and *L. sericata* are reported upon, the details being given in table form. "Diphenyl sulfoxide, *p*-nitroanisole, azobenzene, diazoaminobenzene, *p*-nitrophenetole, phenothioxin, *m*-dinitrobenzene, *p*-chlorodiphenyl, hydrazobenzene, *p*-nitrotoluene, and benzeneazodiphenylamine were the most toxic of the organic compounds to all the species. The toxicity of some of the organic compounds approached that of sodium arsenite, the most toxic of the arsenical compounds tested. Boric acid showed considerable toxicity to all three species. *L. sericata* proved the most resistant of the three species against arsenical compounds and in general to the organic compounds. *P. regina* exhibited slightly greater tolerance than *C. macellaria* to both the organic and inorganic compounds."

Mortality of the apple maggot in fruit held in cold storage, P. J. CHAPMAN and A. D. HESS. (Coop. N. Y. State Expt. Sta.). (*U. S. Dept. Agr. Cir.* 600 (1941), pp. 10, figs. 4).—The study demonstrated that complete mortality of apple maggot eggs and larvae results from 32 days' storage at 32° F. and within 45 days at 36°. Larval activity continues slowly at 40°, but eventually most succumb. The authors suggest a 40-day storage period at 32° for fruit to be exported, since this period would provide time to effect equalization of fruit and air temperature, effect complete mortality, and provide a safety margin.

Oriental rat flea established in Kansas, J. E. ACKERT, H. P. BOLES, and A. W. GRUNDMANN. (Kans. State Col.). (*Science*, 93 (1941), No. 2424, pp. 566-567).—The oriental rat flea, of greatest importance in the interior of the United States because of its transmission of sylvatic plague, which type occurs mostly in wild rodents, has been found to be established in Kansas, observations indicating that it can successfully overwinter at Manhattan.

Tests of certain insecticidal dusts against the striped cucumber beetle, J. W. BROOKS and T. C. ALLEN. (Wis. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 295-297).—In the work conducted, in which a number of materials were tested, a derris dust proved to be the most effective in controlling the striped cucumber beetle. Fluosilicates, arsenicals, and nicotine dusts were less effective in the order named. Under field conditions, sulfur as a diluent appears to improve the toxicity of derris to the beetles.

Statistical problems in estimating populations of Japanese beetle larvae, C. I. BLISS (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 221-232, figs. 6).—The results of estimates of the number of Japanese beetle larvae per square foot in four 50 by 50 ft. areas differing widely in their mean infestations are reported upon statistically.

Observations on Japanese beetle traps, F. B. WHITTINGTON and W. E. BICKLEY. (Univ. Md.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 219-220).—Comparisons made of orange, yellow, and four mixtures of yellow with green indicate that Japanese beetle traps painted yellow are more efficient. Variations in the height of traps show that traps suspended at 30 in. catch more beetles than those at 42, 54, or 66 in. Modifications of colors of parts of traps and certain variations in construction produced no significant differences in effectiveness.

Additional studies on the value of traps in Japanese beetle control, G. S. LANGFORD, F. B. WHITTINGTON, and E. N. COREY (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 237-239).—Data on farm trapping of the Japanese beetle in Maryland are presented. It is shown that 5,338 traps on 6,749 acres of land caught 30.1 percent of the beetles produced in the area, and an analysis of available results obtained on individual farms indicated that many farmers exceeded

this average catch. Several individuals with small farms caught more beetles than calculations indicated that they produced. The results obtained in 1940 compare favorably with the 1939 observations. An analysis of records on the 16 farms showed that 1,041 traps were operated on 3,281 acres. The calculated beetle production on the farms was 170,314 qt. of beetles. A total of 40,888 qt., or 27.5 percent of the total calculated quantity produced, was caught.

Development of milky disease on Japanese beetle larvae under field conditions, R. T. WHITE. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 213-215).—Reporting further (E. S. R., 83, p. 374) on work with this disease of the Japanese beetle, data are presented which indicate the importance of milky disease as a natural control agency in areas supporting heavy populations of larvae. These data show a rapid build-up of disease in such areas and a corresponding decrease in the beetle population following such build-up.

Testing the possible value of milky diseases for control of soil-inhabiting larvae, S. R. DUKY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 217-218).—Methods employed at the U. S. D. A. Bureau of Entomology and Plant Quarantine laboratory at Moorestown, N. J., to determine the effects of the two milky diseases on scarabaeid larvae are outlined.

Susceptibility of certain scarabaeid larvae to infection by type A milky disease, S. R. DUKY. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 215-216).—In continuation of this work (E. S. R., 83, p. 375), report is made of the testing of this disease of Japanese beetle larvae against the larvae of a number of other scarabaeid species. Those found to be susceptible to infection by the disease were as follows: The oriental beetle, Asiatic garden beetle, *Oyclocephala* (*Ochrosidia*) *borealis*, *Phyllophaga* *anxia*, *P. bipartita*, *P. ephillda*, *P. fusca*, *P. rugosa*, *Strigoderma* *arboricola*, and *Strigoderma* *pygmaea*. Two species that did not show susceptibility were the green June beetle and the rose chafer.

White grub found destroying cactus plants is identified; is an aid in range improvement, L. B. DANIELS (*Colo. Farm Bul.* [Colorado Sta.], 3 (1941), No. 2, pp. 12-13, figs. 3).—The larvae of a longhorn beetle responsible for the destruction of cactus on Colorado ranges have been determined as *Moneilema annulata* Say. The importance of proper range management combined with the secondary work of this beetle is helping force out cactus on some ranges.

Control of the potato flea beetle on shade-grown tobacco in Connecticut, A. W. MORRILL, JR. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 291-295, figs. 2).—This is a summary of work conducted in cooperation with D. S. Lacroix of the Connecticut [New Haven] Experiment Station, under way since 1936, earlier reports of which have been noted (E. S. R., 75, p. 80).

Life history of the sugar-beet wireworm in southern California, M. W. STONE (U. S. Dept. Agr., *Tech. Bul.* 744 (1941), pp. 38, figs. 30).—The distribution, life history, habits, and injury of the sugar beet wireworm, a serious pest of sugar beets, lima beans, potatoes, and vegetable crops of the Pacific coast, are discussed. Injury to crops in southern California may begin early in February and continue through the spring and even during the summer months in irrigated fields. Fall-planted crops also are commonly injured.

Adults overwinter in the soil at an average depth of 10.5 in., but start moving upward in December and may be found within a few inches of the surface in February. The earliest emergence noted was on January 25, with the peak occurring between March 16 and 31. Oviposition began out-of-doors as early as March 3 and was observed as late as May 28. The average number of eggs laid per female was 268.1, with a maximum of 704. The incubation period ranged from 23 to 46 days, depending on the temperature, and the larval period

of reared individuals averaged 171.1, 502.8, 857.8, 1,233.8, and 1,589.7 days for those maturing in 1, 2, 3, 4, and 5 yr., respectively. More food was consumed by 3- to 5-month-old larvae during July, August, and September than at any other period of their development, indicating that these are responsible for a large share of the damage to fall-planted crops. Of the reared larvae, 4.1 percent matured the first year, 80.7 percent the second, 13.8 percent the third, 1.2 percent the fourth, and 0.2 percent the fifth year, while, of those in out-of-door cages, 4.5 percent matured the first year, 13.7 the second, and 0.7 percent the third. The prepupal period averaged 7.6 days, and pupation was noted as early as June 13 in 1934 and as late as October 27 in 1931 and 1933, with the peak occurring between September 1 and 22. A range of 13 to 34 days, with an average of 21.4, was noted for the pupal period. In out-of-door cages the depth of pupation ranged from 4 to 24 in., with an average of 10.5.

Important enemies of this wireworm included *Calosoma* beetles, birds, and larvae of the dipterous family Therevidae.

Wireworms and their control on irrigated lands, M. C. LANE. (Coop. Wash. and Idaho Expt. Stas.). (*U. S. Dept. Agr., Farmers' Bul. 1866 (1941), pp. [2]+22, figs. 18*).—Wireworms are important pests on the irrigated lands of the Pacific Northwest. During their long life cycle of from 2 to 5 yr. in the soil they destroy seed, cut off underground stems, and bore holes in the larger stems, roots, and tubers. Potatoes, onions, corn, lettuce, and melons are particularly susceptible to their attacks. Chemical control methods employed are carbon disulfide and crude naphthalene, which act as fumigants to kill the wireworms in the soil, and these are especially suitable for treating small acreages or land where high-priced crops are grown. Certain cultural practices obviate the expense of chemicals and are, therefore, more practical for large tracts. Large numbers of wireworms can be killed by producing either an excess or a deficiency of moisture in the soil during the summer season. Rotations, summer plowing, and adjustments of planting dates are other cultural practices that lessen the number of wireworms or greatly reduce their damage.

Wireworm studies in several potato rotation systems, K. B. NASH and W. A. RAWLINS. (Cornell Univ.). (*Jour. Econ. Ent., 34 (1941), No. 2, pp. 287-290*).—The information here presented supplements that previously noted (E. S. R., 84, p. 369).

The plum curculio problem on peach in Pennsylvania, H. M. STEINER and H. N. WORTHLEY. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 34 (1941), No. 2, pp. 249-255, figs. 6*).—A study of the plum curculio problem on peach in local orchards in the vicinity of the Pennsylvania Station during 1939 and 1940 revealed the presence of adults in the orchard from blossoming period until after harvest, with peaks of abundance of overwintered adults occurring near the petal-fall stage. "In 1940, marked adults moved an average distance of 94 ft. in 12 days after release, with a maximum flight of 671 ft. in 40 days across a sprayed orchard. Egg laying progressed to a considerable extent before the shuck-fall stage, and small drop fruits less than $\frac{1}{8}$ in. in length produced most of the mature larvae. All the larvae matured between June 9 and August 1. The larvae were reared from drop peaches in rearing trays and in mesh bags connected with quart jars by paper funnels. The method of plat lay-out used in 1940, where each treatment was applied to 10 trees in two outer rows of the orchard with records taken from total fruits, seemed to subject each treatment to a fairer test than the latin square design used in 1939, but further refinements in experimental technic are desired. Greater effectiveness in control was attributed to fluorine sprays than to arsenicals, but the injury to foliage and small fruits that occurred during an early wet period in 1940 sug-

gests that they merit further trial only in combination with possible safeners. Acid lead arsenate safened with zinc sulfate and hydrated lime was only slightly more effective than either basic lead arsenate or cube root, but three sprays did not greatly reduce the number of curculio larvae that matured when compared with unsprayed checks among the experimental treatments."

Honeybee population and floral competition in New Jersey orchards, R. S. FILMER. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 198-199).—The results of studies of the honeybee distribution on blooming orchard plants and apple varieties in low and in high honeybee population areas, respectively, at Glassboro, May 1-3, 1939, and of honeybee counts in the experimental orchard at New Brunswick on May 14-15, 1940, are reported upon, the details being given in tables.

A new species of Anthophora from California (Hymenoptera: Apoidea), P. H. TIMBERLAKE. (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent.*, 17 (1941), No. 1, pp. 34-36).

Three years' survey and liberation of oriental fruit moth parasites in peach orchards in northern New Jersey, B. F. DRIGGERS. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 239-244).—Surveys made of parasitism of twig-feeding larvae of the oriental fruit moth in a number of peach orchards in New Jersey over a period of 4 yr. have in general confirmed earlier surveys, "when it was found that *Macrocentrus ancyliivorus* Rohr, was the principal parasite attacking twig-feeding larvae in southern New Jersey, whereas *Glypta rufescutellaris* Cres. proved to be the principal parasite in northern New Jersey. Two of the northern New Jersey orchards surveyed from 1938 to 1940, inclusive, showed *Macrocentrus* instead of *Glypta* as the principal parasite. Investigation revealed that colonies of *M. ancyliivorus* adults had been liberated near these two orchards in 1931, and it is suggested that the parasites made their way to these two orchards from the point of liberation. Liberations of *M. ancyliivorus* in 1939 in two widely separated orchards in northern New Jersey where the parasite had not been recovered previously were followed by a high degree of parasitism by this species on second- and third-brood larvae. A second liberation of *M. ancyliivorus* in another northern New Jersey orchard in 1940 also was followed by a heavy build-up of the parasite on second and third broods. Surveys of nearby orchards indicated *M. ancyliivorus* spread to a distance of 6 miles from the point of liberation at the time they were liberated. Surveys in 1940 in the two liberation orchards of 1939 and in nearby orchards indicated that *M. ancyliivorus* wintered over successfully and built up to a point where it became the principal parasite reared from these orchards during the season."

Ten-year record of oriental fruit moth parasitism in Delaware, L. A. STEARNS and J. M. AMOS. (Del. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 245-248, fig. 1).—The extent of natural control of the oriental fruit moth by larval parasites found in the course of a study of the bionomics and control of this pest at the Delaware Station since 1928 is summarized. The data obtained have shown that larval parasitism has always been extremely high, averaging 61.9 percent. Consequently, peach infestation has usually been very low, with losses in excess of 10 percent the exception. This favorable situation is due almost entirely to the abundance and activity of a single parasite, *Macrocentrus ancyliivorus* Rohr. None of 27 other species recorded has ever been recovered in appreciable numbers from this host, and all must be considered relatively unimportant, therefore, in preventing damage by this notably destructive insect.

Host relations and geographic distribution of new species of the genus Eurytoma from Mexico, R. E. BUGBEE. (Kans. State Col.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 2, pp. 54-57).

A study of the control of the coconut caterpillar *Nephantis serinopa* Meyr. in Ceylon, with special reference to its eulophid parasite *Trichospilus pupivora* Ferr., T. J. JAYABATNAM (*Trop. Agr. [Ceylon]*, 96 (1941), No. 1, pp. 3-21, pls. 3, figs. 2).

Investigations on *Spathius critolaus* Nixon, an important braconid parasite of the cotton-stem weevil *Pemphres affinis* Fst. of South India, P. N. KRISHNA AYYAR (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 879-900, pls. 2, figs. 2).—Report is made of a study of the biology of an indigenous primary ectophagous parasite (*S. critolaus*) of the larvae of *P. affinis*, the most important pest of cotton in South India, where it causes a loss of 30 percent or more in cases of severe outbreaks.

Toxicity of methyl bromide to the common red spider and to greenhouse roses, C. C. HAMILTON. (N. J. Expt. Stas.). (*Jour. Econ. Ent.*, 34 (1941), No. 2, pp. 232-237, figs. 6).—Report is made of extensive tests conducted under carefully controlled conditions to determine the minimum concentration of methyl bromide necessary to give 100-percent kill of the common red spider and the maximum concentration six varieties of greenhouse roses would tolerate when fumigated at temperatures of 50°, 60°, 70°, and 80° F. for periods of 1, 2, 4, and 8 hr. The details are summarized in six graphs. The data demonstrate that within the limits of the tests, the kill at any temperature is essentially a product of length of exposure and concentration of methyl bromide. Thus, knowing the concentration giving 100-percent kill at one temperature and one length of exposure, the concentration giving 100-percent kill for any other length of exposure at the same temperature can be calculated. Further, as the temperature of fumigation decreased from 80° to 50° the concentration of methyl bromide giving 100-percent kill of the red spider increased at an accelerated rate, but further data are needed before this relation can be expressed mathematically. The data showing the tolerance of six varieties of rose plants to methyl bromide fumigation show essentially the same relations between concentration of methyl bromide, temperature of fumigation, and length of exposure as was shown for the tests on the common red spider.

At a temperature of 50° the concentration of methyl bromide tolerated by the rose plants is distinctly less than that required to give 100-percent kill of the common red spider, but as the temperature of fumigation increased from 50° to 60° and 60° to 70° the toxicity of the methyl bromide to the common red spider increased at a more rapid rate than did the toxicity to the rose plants and the concentrations tolerated by the rose plants and giving 100-percent kill became the same. Stating it in another way, the margin of safety between plant tolerance and red spider kill is less at the lower temperatures. Under the conditions of the experiments a concentration of methyl bromide giving 100-percent kill of the common red spider injured the most susceptible of six varieties of greenhouse roses.

ANIMAL PRODUCTION

[Investigations in cattle and poultry production by the Alabama Station] (*Alabama Sta. Rpt. 1939*, pp. 24, 28-29).—Brief reports by J. C. Grimes, G. J. Cottier, and D. F. King are included on studies of the value of shelters and of ground and unground peanut hay as roughages for fattening steers, kudzu and other summer green feeds for poultry, detecting infertile eggs prior to incubation, and the effect of period of illumination on fertilizing ability of ♂ fowls.

[Animal husbandry studies in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), Nos. 3, pp. 1, 8; 4, p. 7).—These numbers contain the following articles: No. 3, Investigations in Animal Husbandry Expanded to Supply Increas-

ing Needs, by R. H. Means (pp. 1, 8); and No. 4, Silage Mixture of Soybeans, Sorghum Compared With Straight Sorghum Silage in Mix for Wintering Beef Cows, by A. E. Cullison (p. 7).

[Experiments in animal production by the Nevada Station] (*Nevada Sta. Rpt. 1940*, pp. 21, 35-37, fig. 1).—Brief results are reported by C. E. Fleming, A. Young, and F. B. Headley on a comparison of combinations of chopped and long alfalfa hay with barley, corn silage, and rye for feeding and finishing range ewes and lambs; comparison of rations for purebred and crossbred Duroc-Jersey \times Poland China pigs; uniformity of gains of turkeys bred for small size and earliness; and comparison of first, second, and third cuttings of alfalfa hay for steers.

[Investigations in livestock production by the Tennessee Station] (*Tennessee Sta. Rpt. 1939*, pp. 21-23, 64-65, 66, 72, fig. 1).—Brief progress reports are given by D. E. Williams and L. R. Neel on the results of studies on wintering beef calves on rations supplying different amounts of phosphorus, bluegrass pasture supplemented with alfalfa hay for growing and finishing beef cattle, and shade for beef cattle pasture, and by B. P. Hazlewood on shelled corn v. barley for hogs.

[Experiments in livestock production by the Washington Station] (*Washington Sta. Bul. 394* (1940), pp. 27-30, 34-37, 78-80, 80-82).—There are included brief results by H. Hackedorn, H. P. Singleton, W. H. Burkitt, J. Sotola, H. G. McDonald, M. M. Boggs, J. W. Cook, M. Rhian, J. L. St. John, K. Groves, E. I. Robertson, J. S. Carver, and L. A. Wilhelm of investigations on beet molasses, wet beet pulp, and grains for ewes suckling lambs; nutritive value of different cuttings of smooth bromegrass for sheep; alfalfa meal v. sweetclover meal for bred gilts; storage and aging of beef; nutritional requirements of turkeys; protein requirements of chicks; relation of composition of egg white to quality; protein requirements for laying hens; the gross value of protein supplements for poultry; evaluation of protein concentrates with hens; variations in cereal content of the Washington chick starting mash; influence of salmon meal on egg flavor; light requirements of laying hens; embryonic development of turkeys; growth and calcification of Bronze turkey poults from hens fed different levels of vitamin D; vitamin D requirements of turkeys; and heredity, environment, and storage conditions as affecting interior egg quality.

[Studies on animal production by the Wisconsin Station] (*Wisconsin Sta. Bul. 451* (1941), pp. 27-36).—Reports are given of studies by G. Bohstedt, J. M. Fargo, W. A. King, O. B. Ross, J. G. Halpin, C. E. Holmes, C. A. Herrick, W. W. Cravens, S. B. Randle, and C. A. Elvehjem on levels of minerals for pigs, the use of salt in the prevention of some types of cannibalism in poultry, the effect of sulfur feeding and accessibility to sunlight on the incidence of rickets and coccidiosis in chickens, the type of floor in battery brooders v. lack of sunlight as the cause of slipped tendon in chicks, soybean meal and infertile eggs as protein supplements in chick rations, dried distillery residues as substitutes for milk in feeding chicks, poultry mashes without milk and their effect on hatchability, vitamin K requirements of hens, and the increased growth rate resulting from a high-protein ration.

The storage of artificially dried grass, N. C. WRIGHT (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 194-211, pl. 1, figs. 7).—The moisture content of artificially dried grass in the British Isles was found to fluctuate between 18 and 30 percent with winter humidity ordinarily encountered of from 80 to 95 percent. The critical humidity for mold growth was between 67 and 80 percent, and the rate of development of mold growth on dried grass stored for different periods was a definite function of relative humidity. However, it was found

that moisture as low as 13 percent in the dried grass did not confer absolute immunity to mold growth, and heated, fruity, and musty odors were developed. Some irregularity was noted in mold growth in that some samples developed molds below 13 percent moisture and in others no growth occurred above 13-percent levels. In one instance no mold occurred until the dried grass had been stored for 300 days. Detection of early mold growth by plating was unsuccessful.

The influence of Corriedale, Southdown, and Hampshire breeding in lamb and wool production, H. H. LEVECK (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 5, p. 7).—Comparison of the lamb and wool production by native ewes bred to Corriedale, Hampshire, Southdown, and native rams showed little difference. All three groups of crossbred lambs averaged Good plus at marketing time. The Southdown \times native showed a slight advantage in compactness.

Relation of diet of swine to development of locomotor incoordination resulting from nerve degeneration, N. R. ELLIS and L. L. MADSEN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 5, pp. 303–316, pls. 2, fig. 1).—Further study of rations for the prevention of lameness in swine (E. S. R., 77, p. 672) showed that a deficiency of nutritional origin caused the difficulty. It could be controlled within limitations by natural feedstuffs. Five groups of diets based on yellow corn, tankage, linseed meal, alfalfa leaf meal, and minerals, with supplements and replacements of corn gluten meal, pork liver, barley, wheat, oats, rice bran, casein, dried whey, whey concentrate, wheat-germ oil, dried skim milk, and molasses, including heated diets, were fed to pigs between 10 and 12 weeks of age for a period of from 12 to 24 weeks, and in some cases to rats. When the diets were subjected to heat at from 115° to 120° C. for from 30 to 40 hr., the disease was rather generally produced in the pigs. Histological studies showed myelin degeneration of the nerves and spinal cord which was paralleled by the severity of the symptoms.

The nutrition of the bacon pig.—VI. The minimum level of protein intake consistent with quick growth and satisfactory carcass quality, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 232–245).—As earlier investigations (E. S. R., 83, p. 810) showed that half the amount of protein considered necessary for optimum growth in bacon pigs gave good results, the experiment was repeated with reduction and finally elimination of both fish meal and soybean meal during the latter part of the feeding periods. The ration, consisting of 5 percent of fish meal up to 90 lb., 2 percent from 90 to 150 lb., and no protein supplement to slaughter at about 200 lb. live weight, gave almost as good gains and efficiency of feed utilization as a ration of 10 percent of fish meal up to 150 lb. and 5 percent of soybean meal up to slaughter. Poorer protein rations before 90 lb. retarded growth, but the set-back tended to be wiped out in the later stages of feeding. Lowering the protein supply after 90 lb. live weight had been attained did not interfere with the leanness and quality of the bacon carcasses.

Soybean oil meals for pigs, W. L. ROBISON (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 56–63).—In further studies (E. S. R., 63, p. 560) it was found that a relatively high feeding value for swine was produced by the extraction, hydraulic, and expeller methods. In the average of 11 trials, pigs receiving supplements of soybean meal and minerals were ready for market 4 days later than those fed tankage and required 5 lb. more feed per 100 lb. of gain. Other high-protein feeds were advantageous as a part of the protein mixture, especially for dry lot feeding.

The value of fish refuse as a food for pigs, C. W. S. HARTLEY (*Malayan Agr. Jour.*, 29 (1941), No. 3, pp. 118–126).—In two tests of 5 and 6 months' dura-

tion, dried and fresh fish refuse satisfactorily replaced all of the additional minerals and much of the protein in a balanced ration. The results showed no significant difference in the rate of gain from the fresh and dried fish, except that the salt had to be souked from the dried product. There was no taint in the fish-fed carcasses, but the meat was pronouncedly paler in color than normal. It was of equally good flavor.

[Experiments in poultry production by the Western Washington Station] (*Western Washington Sta. Rpt. 1940*, pp. 44-48, 50-52).—Brief results are given by G. E. Bearse, C. F. McClary, and V. L. Miller on studies on the relation to cannibalism of bulk and fiber and the form in which the ration is fed; influence of ground grain and mill run on hatchability, growth, and mortality in poultry; vitamin A requirements of laying hens; methods of feeding laying hens; limitations in yellow corn feeding in chick starting rations; and Vacatone as a source of vitamin G in chick starting rations.

Big returns from clover pasturage used for pullets, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 209 (1941)*, pp. 44-48, fig. 1).—Advantages in isolation of chicks on clover and alfalfa pastures away from other groups and on other pastures accrued from the lowered feed costs and mortality in several trials.

Seasonal loss of condition in Rhode Island Red and other fowls in Malaya, G. E. MANN (*Malayan Agr. Jour.*, 29 (1941), No. 3, pp. 107-117, pls. 2).—Monthly variations in the rainfall, mortality, diseases, egg production, and physiological condition in purebred Rhode Island Red, native, and crossbred fowls are tabulated from 1936 to 1940.

A 3-year study of out-of-season hatching, F. P. JEFFREY and C. S. PLATT (*New Jersey Stat. Bul. 687 (1941)*, pp. 23).—Spring-hatched pullets were superior to fall- and winter-hatched birds in fertility, viability, efficiency of feed utilization, annual production, and production of large eggs. However, fall- and winter-hatched pullets were superior in rate of growth to 24 weeks, body weight at the end of the first laying year, and albumen index of the eggs produced in the summer months. The results were based on an analysis of records of production in approximately 100 pullets hatched in January, April, June, September, and November in each of 3 yr., 1936-39. The fertility and hatchability of September and November hatches were lower than hatches in the other seasons. Considering all factors, a longer spring hatching season, with selection for viability and persistency, was preferred to a combination of spring and fall hatching.

Projector lamps for brooding chicks, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 209 (1941)*, pp. 48-52, figs. 3).—A home-made electric brooder recommended for simplicity is described.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the 36th annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci.*, 24 (1941), No. 6, pp. 490-548).—Following are listed the titles and authors of papers pertaining either to dairy manufacturing or dairy production, presented at the annual meeting of the association (E. S. R., 83, p. 672) held at Burlington, Vt., June 23-26, 1941: New D. H. I. A. Conversion Factors—by Breeds, by J. F. Kendrick (p. 490) (U. S. D. A.); A Study of the Growth of 4-H Dairy Heifers and the Reliability of Heart Girth Measurements as a Means of Estimating Liveweight, by H. A. Willman and G. W. Salisbury (pp. 492-493) (Cornell Univ.); The Hormonal Preparation of Rats for Lactation, by R. P. Reece (pp. 497-498) (N. J. Expt. Stas.); The Effect of Thyroprive Goat's

Milk on Experimental Hyperthyroidism, by J. W. Hibbs, T. S. Sutton, and W. E. Krauss (pp. 498-499) (Ohio Sta.); The Effect of Thyroxine on the Lactogenic Hormone in the Urine of Dairy Goats, by V. Hurst, J. Meites, and C. W. Turner (p. 499) (Mo. Sta.); Effect of Diethylstilbestrol on Milk Secretion, by A. Spielman, L. M. Ludwick, and W. E. Petersen (pp. 499-500) (Univ. Minn.); Anatomy and Physiology of the Teat Sphincter, by D. Espe and C. Y. Cannon (p. 500) (Iowa State Col.); A Comparison of the Utilization of β -hydroxybutyric Acid, Glucose, and Oxygen by the Lactating Mammary Gland of the Normal and Ketosis Cow, by J. C. Shaw (pp. 500-501), The Effect of Glucose Feeding Upon the Concentration of Acetone Bodies in the Blood and Urine, and Upon the Milk and Milk Fat Produced in the Normal Bovine, by C. B. Knodt (pp. 501-502), The Effect of Ketosis and Glucose Therapy in Ketosis Upon Milk Fat Synthesis, by J. C. Shaw (p. 502), A Study of Normal Variations of Acetone Bodies in the Blood and Urine of Dairy Cattle, by C. B. Knodt (pp. 502-503), and Glucose Therapy in Ketosis Cattle, by J. C. Shaw and R. C. Powell, Jr. (pp. 503-504) (all Univ. Conn.); Progress Report on the Relation of the Ration to the Composition of Milk, by E. B. Powell (pp. 504-505); The Influence of Frequency of Milking on Milk Production, by L. M. Ludwick, A. Spielman, and W. E. Petersen (p. 505) (Univ. Minn.); The Chlorine Tolerance of Certain Mastitis Bacteria, by R. K. Waugh, P. R. Elliker, J. H. Hilton, and J. F. Bullard (pp. 506-507) (Ind. Sta.); Influence of Oat Juice Extract Upon the Age of Sexual Maturity in Rats, by E. T. Gomez, A. M. Hartman, and L. P. Dryden (pp. 507-508) (U. S. D. A.); The Effect of a High and a Low Protein Ration on the Gonadotropic Content of Male Rat Pituitaries, by E. J. Weatherby and R. P. Reece (p. 508) (N. J. Stas.); The Evaluation of Fertility in Dairy Bull Semen, by H. A. Herman and E. Swanson (pp. 508-509) (Mo. Sta.); The Effect of Exercise on the Amount and Quality of a Dairy Bull's Semen, by O. L. Leopard, C. E. Shuart, and A. Foster (p. 509) (N. J. Stas.); Some Factors Influencing the Reproductive Efficiency of Louisiana Herds, by D. M. Seath and C. H. Staples (p. 510) (La. State Univ.); Progress Report on a Roughage Program in Herd Management, by C. B. Bender (pp. 510-511) (N. J. Stas.); The Approved Ayrshire Sire Program, by C. T. Conklin (pp. 511-512); Some Chemical Determinations Useful in Silage Studies, by A. E. Perkins (pp. 512-513) (Ohio Sta.); Corn Meal as a Grass Silage Preservative, by G. Bohstedt, W. H. Peterson, and G. P. Bahler (pp. 513-514) (Univ. Wis.); Trench Silos for Preserving Cereals Treated With Molasses or Phosphoric Acid, by H. A. Herman, A. C. Ragsdale, and W. Heathman (pp. 514-515) (Mo. Sta.); Calculating Pasture Yields With Dairy Heifers as Experimental Animals, by H. B. Morrison and F. Ely (pp. 515-516) (Ky. Sta.); A Study of the Relationship of Fat Content in the Dairy Grain Ration to Milk and Butterfat Production, by C. F. Monroe and W. E. Krauss (p. 516) (Ohio Sta. et al.); The Influence of Sustained High Fat Intake Upon Milk Fat Production, by N. N. Allen and J. B. Fitch (pp. 516-517) (Univ. Minn.); The Relation on Mineral Intake and Sunshine to the Vitamin D Deficiency of Mature Dairy Cattle (pp. 517-518), and Observations on the Quantitative Requirement of Mature Dairy Cattle for Vitamin D (pp. 518-519), both by G. C. Willis (S. Dak. Sta.); Relation of Skeletal Reserves of Calcium and Phosphorus Laid Down During Growth to Persistence of Milk Production of Dairy Cows, by L. S. Palmer and T. W. Gullickson (pp. 519-520) (Univ. Minn.); The Effect of Feeding Chloretone (Trichlorobutyl Alcohol) on the Blood Plasma Ascorbic Acid of Dairy Cattle, by A. L. Bortree, E. C. Scheidenhelm, and C. F. Huffman (pp. 520-521) (Mich. State Col.); Some Observations on the Carotene Content of the Blood Plasma of Dairy Cows, by

H. Goss and S. W. Mead (pp. 521-522) (Univ. Calif.); Vitamin A Levels in the Blood Plasma of Dairy Cattle on Winter Rations and the Influence of Vitamin A Supplementation on Certain Constituents of the Blood, by P. H. Phillips, P. D. Boyer, H. A. Lardy, and N. S. Lundquist (p. 522), and The Blood Plasma Vitamin A Content of the New Born Calf and Its Relation to Certain CalfhooD Diseases, by P. H. Phillips, N. S. Lundquist, and P. D. Boyer (p. 522) (both Univ. Wis.); The Carotene (Provitamin A) Requirements of Dairy Cattle for Lactation, by A. H. Kuhlman and W. D. Gallup (pp. 522-523) (Okla. A. and M. Col.); Further Studies of the Effects of Vitamin A Deficiency on Reproduction, by S. L. Hansard and T. S. Sutton (pp. 523-524) (Ohio Sta.); Some Ocular Changes and Deficiency Manifestations in Mature Cows Fed a Ration Deficient in Vitamin A, by L. A. Moore (pp. 524-525) (Mich. State Col.); The Role of Acid Cleaning Agents in Dairy Detergency, by M. E. Parker (p. 525); The Value of Acidifying Milk and Cream Cans From the Standpoint of the Effect Upon Quality, by A. Rippen and L. H. Burgwald (pp. 525-526) (Ohio State Univ.); The Bacteriological Spoilage of Milk Held Near the Freezing Point, by J. M. Sherman, G. M. Cameron, and J. C. White (pp. 526-527) (Cornell Univ.); Thermoduric Bacteria in Milk—III, The Effect of Changing Agar and Temperature of Incubation for Plate Counts on the Problem of Thermoduric Bacteria in Milk, by J. L. Hileman, C. Moss, and B. Stead (p. 527) (see page 525); Effect of Growth of *Pseudomonas putrefaciens* on Aroma Compounds in Butter, by P. R. Elliker and B. E. Horrall (p. 528) (Ind. Sta.); The Effect of *Streptococcus agalactiae* Upon the Standard Plate Count of Milk, by M. E. Morgan and E. O. Anderson (pp. 528-529) (Univ. Conn.); The Lethal Effectiveness of Ultraviolet Rays Applied to Milk, by G. C. Supplee, G. E. Flanigan, and O. G. Jensen (pp. 529-530); Bacteriological Problems in Short Time High Temperature Pasteurization, by H. Wainess (p. 530); The Foaming of Milk and Certain Milk Products in Relation to Their Surface-Active Constituents, by M. S. El-Rafey and G. A. Richardson (pp. 530-531) (Univ. Calif.); Factors Affecting the Gas Content of Milk, by C. I. Noll and G. C. Supplee (pp. 531-532); Factors Influencing the Response of Cream to a Rebodying Process, by F. M. Skelton and H. H. Sommer (pp. 532-533) (Univ. Wis.); An Improved Micro-Kjeldahl Apparatus and Procedure for the Analysis of Milk, by M. C. Rhees, T. B. Freeman, and C. N. Shepardson (pp. 533-534) (Tex. A. and M. Col.); A Progress Report on the Utilization of Apple Products, Especially Apple Syrups and Juices, in Producing Soft-Curd Milk, by C. C. Flora and C. W. Holdaway (p. 534) (Va. Sta.); The Determination of Citric Acid in Milk by the Pentabromoacetone Method, by E. F. Deyssher and G. E. Holm (pp. 534-535), and The Effect of Flash Forewarming Upon the Heat Stability of Evaporated Milk, by B. H. Webb and R. W. Bell (p. 535) (both U. S. D. A.); The Influence of Homogenizing Pressures on the "Dryness" of Ice Cream When Drawn From the Freezer, by J. H. Erb and J. Whitworth (pp. 535-536) (Ohio State Univ.); Monoglyceride-Gelatin as an Ice Cream Stabilizer, by P. S. Lucas (pp. 536-537) (Mich. State Col.); A Method for the Preparation of Acid Casein for Use in Ice Cream, by L. P. Teichert, T. R. Freeman, W. S. Arbuckle, and C. N. Shepardson (pp. 537-538) (Tex. A. and M. Col.); The Temperature Method for Control of Whipping in Ice Cream, by A. Leighton (p. 538) (U. S. D. A.); Motion Pictures as a Medium for the Study of Ice Cream, by W. H. E. Reid, C. W. Decker, L. E. Smith, K. R. Minert, W. S. Arbuckle, and J. Edmondson (pp. 538-539) (Mo. Sta.); Homogenization Index as Calculated From Measurements of Fat Globule Size, by A. W. Farrall, C. W. Waits, and R. L. Hanson (p. 539); The Effects of the Direct Addition of Carotene and Mixed Tocopherols on the Development of

Oxidized Flavor in Milk, by E. B. Williams and L. H. Burgwald (pp. 539-540) (Ohio State Univ.); The Influence of Treated Fibre Milk Containers on the Incidence of Copper-Induced and Sunshine Oxidized Flavors of Milk, by C. L. Roadhouse and J. L. Henderson (pp. 540-541) (Univ. Calif.); An Electric Laboratory Pasteurizer, by H. B. Henderson, T. B. Harrison, C. E. Wylie, and H. A. Arnold (p. 541), and Observations Regarding the Occurrence of Oxidized Flavor in Milk From Individual Cows, by H. B. Henderson, W. W. Overcast, and C. E. Wylie (pp. 541-542) (both Univ. Tenn.); A Small Electric Holder Type Pasteurizer, by C. W. England, A. P. Wiedemer, and G. J. Burkhardt (p. 542) (Md. Sta.); Some Factors Influencing the Quality of Cream Cheese, by B. M. Zakariasen and W. B. Combs (pp. 543-544) (Univ. Minn.); A Short Method of Making a Soft Cheese Similar to Cream Cheese, by E. L. Reichart and L. K. Crowe (p. 544) (Univ. Nebr.); A Survey of Commercial Cottage Cheese, by M. J. Foter, E. O. Anderson, and L. R. Dowd (pp. 544-545) (Univ. Conn.); The Relationship of Acidity to the Quality of American Cheddar Cheese, by H. L. Wilson, S. A. Hall, and H. R. Lochry (p. 545) (U. S. D. A.); Keeping Quality of Butter Stored at Low Temperature for Six Years, by B. J. Scheib, E. S. Guthrie, and C. N. Stark (pp. 545-546) (Cornell Univ.); and Mold Mycelia in Cream (pp. 546-547), and Effect of Udder Infection and Late Lactation on the Methylene Blue-Borax Test for Mold Mycelia in Cream (pp. 547-548), both by E. R. Garrison and J. H. Gholson, and The Effect of Various Factors on Mold Mycelia in Cream and Butter, by W. H. El. Reid, J. Edmondson, and W. S. Arbuckle (p. 548) (all Mo. Sta.).

[Investigations with dairy cattle and dairy products in Tennessee] (*Tennessee Sta. Rpt. 1939*, pp. 20-21, 66, 72).—Included are brief progress reports on rye and crimson clover used as winter pasture v. sorghum-corn silage for dairy cattle, and feasibility of pasture irrigation, both by L. R. Neel; a roughage and all-year-pasture method of feeding dairy cattle v. the usual method of feeding, in which grain is added to the ration, by B. P. Hazlewood; and the influence of various rations for dairy cows upon the flavor of milk and factors causing objectionable flavors in raw and pasteurized milk, by H. B. Henderson.

[Dairy cattle investigations by the Western Washington Station]. (*Coop. Wash. Expt. Sta. and U. S. D. A.*). (*Western Washington Sta. Rpt. 1940*, pp. 19-23).—Results are briefly noted for the following studies: Dairy herd improvement through the continuous use of proved sires, the effect of the type of construction on the losses and nutritive value of stack silage, and roughage alone v. roughage plus a limited amount of concentrates as rations for growing and lactating dairy cattle, all by R. E. Hodgson, J. C. Knott, and F. B. Wolberg; and the value of liquid manure for pastures, by Hodgson, K. Baur, Knott, and Wolberg.

[Investigations with dairy cattle and dairy products in Washington] (*Washington Sta. Bul. 394* (1940), pp. 37-42).—In addition to progress reports above, results are briefly presented for the following: The gas requirements of certain molds of significance in dairying, the manufacture, ripening, and development of foreign varieties of cheese, and the suitability of certain dairy products for frozen pack methods and the canning of cheese for storage, all by N. S. Golding; the development of special varieties of cheese suitable to Washington conditions, by H. A. Bendixen and C. C. Prouty; and the chemical factors affecting the quality of dry milk solids for baking purposes, by U. S. Ashworth, Golding, G. H. Farrah, and H. Harland.

[Pasture and silage investigations in Wisconsin] (*Wisconsin Sta. Bul. 451* (1941), pp. 1-4, 23-26, figs. 3).—Included are brief progress reports on the

yields and grazing days obtained from brome-grass-legume pasture, reed canary grass, mixed grasses and legumes, Sudan grass, and Kentucky bluegrass pastures, a critical evaluation of canary grass, Sudan grass, and bluegrass, and recommendations for a sound pasture program, by R. Sirny, H. L. Ahlgren, E. Truog, and W. D. Hoard; the length of time silage will keep in a trench silo, by G. Bohstedt and S. A. Witzel; a comparison of hybrid corn v. open-pollinated corn for silage, by Bohstedt, W. A. King, I. W. Rupel, C. E. Zehner, and N. P. Neal; the palatability of rye silage, by Bohstedt, B. H. Roche, Rupel, and Zehner; and the nontoxic effect of full-grown frosted Sudan grass and sorghum, by Bohstedt and H. H. Hull.

Silage value emphasized for dairymen, J. S. MOORE (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 3, pp. 1, 8).—In addition to a general discussion of the merits of silage, data are presented to indicate that a materially greater yield of total digestible nutrients per acre at a lower cost per unit of nutrients may be obtained from sorghum silage than from legume hay.

Adequacy of "home grown" rations in protein and mineral matter for growth in dairy heifers, I. W. RUPEL, G. BOHSTEDT, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 333-337).—This study involved a comparison of six experimental rations for Holstein heifers from approximately 6 mo. to 2 yr. of age. Timothy hay and corn silage constituted the roughage in three cases, and alfalfa hay and corn silage in the other three cases. Corn, oats, and salt were included in all concentrate mixtures, with gluten meal or bran plus gluten meal plus linseed meal being added as supplements to the timothy hay rations and bran or bonemeal as supplements to the alfalfa hay ration. In all cases, hay, silage, and grain were fed in a 1:2:1 ratio. The lot of heifers receiving timothy hay, silage, corn, oats, and gluten meal made practically the same average daily gain (1.41 lb.) as those lots receiving alfalfa hay (1.41-1.46 lb.), while the group receiving the timothy hay, silage, corn, and oats made a significantly lower average daily gain (1.26 lb.). Blood studies made after heifers had been on the experimental rations for approximately 18 mo. showed the blood calcium and phosphorus levels to be normal in all cases. It is concluded that simple home-grown rations are adequate for growth in dairy heifers. When alfalfa hay was fed, the mixture of equal parts of corn and oats was not improved by the addition of bonemeal or wheat bran. Timothy hay, corn, and oats furnished too little protein for optimum growth, but the simple addition of protein from corn gluten meal promoted as rapid growth as was obtained by using a more complex mixture including wheat bran, linseed meal, and corn gluten meal.

Changes in milk yield and feed consumption of dairy herds in Sweden [trans. title], J. AXELSSON (*K. Lantbr. Akad. Tidskr.*, 80 (1941), No. 1, pp. 37-51; *Eng. abs.*, pp. 50-51).—Data are presented indicating changes in milk yield and feed consumption of the controlled dairy herds in Sweden from the period 1910-14 to the period 1934-38. The number of tested cows in the whole country increased by 54.2 percent. The average yield per cow of milk, butterfat, and fat-corrected milk (4-percent milk) increased 23.3, 32.9, and 28.7 percent, respectively, during this period. The average total feed consumption per cow increased 24.9 percent, but the total consumption of concentrates decreased by 7.9 percent while the use of succulent fodder underwent little change and the percentage of feed units for pasture increased about 15 percent. During 1934-38 feed units obtained for different feeds were as follows: Oil cakes 10.9, other concentrates 12.8, roots 10.8, other succulent winter fodder 4.3, pasture 30.9, other green crops 1.7, hay 18.6, and straw 10.0 percent.

The vitamin A content of milk and storage tissues of dairy cows as related to pasture and feeding practices, (*Alabama Sta. Rpt. 1939, pp. 25-26*).—Progress results obtained by C. J. Koehn are briefly reported on the photoelectric determination of vitamin A and carotene in milk, the relation of colorimeter reading to vitamin A activity of milk in terms of International Units, seasonal variation of the carotene content of pasture grasses, and seasonal variation of the vitamin A content of milk.

Feeds given cows influence quality of southern butter, F. H. HERZER (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), No. 3, pp. 1, 6*).—A summary of research noted (*E. S. R., 84, p. 98*).

The relationship between type and production, L. COPELAND (*Jour. Dairy Sci., 24 (1941), No. 4, pp. 297-304*).—Further studies have confirmed an earlier report (*E. S. R., 80, p. 98*) that type and producing ability in dairy animals are not incompatible and that they can readily be combined in the same animal. It appeared that about the same degree of correlation existed between the conformation of a cow and that of her daughters as between the producing ability of a cow and that of her daughters. No apparent relationship was observed between the conformation of a bull and the producing ability of his daughters. It is concluded that to secure the ideals of type and production breeders must continue to pay close attention to both of these essentials in their breeding programs.

The use of nembutal anesthesia in milk secretion studies, E. P. REINEKE, M. B. WILLIAMSON, and C. W. TURNER. (*Mo. Expt. Sta.*). (*Jour. Dairy Sci., 24 (1941), No. 4, pp. 317-320*).—Goats maintained under nembutal anesthesia were found to secrete milk of normal composition at a normal rate. Also arterio-venous blood differences indicated that the uptake of milk precursors continues under these conditions. The advantages of anesthetizing animals in this manner to prevent excitement while drawing arterial and venous blood samples are discussed.

[Proceedings of the thirty-third annual convention of the International Association of Milk Dealers] (*Internatl. Assoc. Milk Dealers, Assoc. Buls. 3 (1940), pp. 71-79; 6, pp. 159-176, 180-184, fig. 1; 9 (1941), pp. 223-245, figs. 5; 11, pp. 275-298; 12, pp. 301-306, fig. 1; 13, pp. 317-357, figs. 31; 14, pp. 361-389, fig. 1; 15, pp. 399-403, fig. 1; 16, pp. 418-430, figs. 2; 17, pp. 443-463, figs. 6; 19, pp. 491-520; 20, pp. 523-550, fig. 1; 21, pp. 553-570*).—The following papers were presented at the meeting held at Atlantic City, N. J., October 21-23, 1940: New Developments in Glass Milk Containers, by S. Faron (pp. 71-79); Improving Dairy Herds to Lower the Cost of Milk Production, by O. E. Reed (pp. 159-164) (U. S. D. A.); Dealer-Producer Cooperation for Efficient Milk Production, by H. B. Ellenberger (pp. 165-170) (Univ. Vt.); Lowering Costs Through Efficient Farm Management, by E. S. Brigham (pp. 171-170); Discussion of Symposium on Efficient Milk Production, by C. W. Holdaway (pp. 180-184) (Va. A. and M. Col.); Problems in Handling Glass Containers for Milk, by J. H. Toulouse (pp. 223-234); Progress Report on Lighting in Milk Processing, by J. O. Kraehenbuehl (pp. 235-245) (Univ. Ill.); Loss of Fresh Milk Sales to Evaporated Milk and Related Farm Price Policies, by C. W. Pierce (pp. 275-282) (Pa. State Col.); Differentials for Class I Milk Over the Evaporated Code Price, by R. K. Froker (pp. 283-290) (Univ. Wis.); What Are the Extra Costs of Requirements for the Production of Fluid Market Milk Over Milk for Manufacturing Purposes, by P. Young (pp. 291-298); Use of Two and Four Quart Bottles and Examination of Distribution Costs in Search of Saving, by A. J. Bergfeld (pp. 301-306); Milk Production Trends, by J. L. Wilson (pp. 317-330) (U. S. D. A.); Disease Dissemination Through

Public Sales, by R. A. Hendershott (pp. 331-335); Milking Machines—Their Operation and Effect Upon Production and Mastitis, by A. C. Dahlberg (pp. 336-340) (N. Y. State Expt. Sta.); A Study of Milk Cooling Systems for the Farm, by F. C. Fenton (pp. 341-357) (Kans. State Col.); A Study of the Time-Temperature Relationships in the Pasteurization of Milk as Regards Creaming, Phosphatase, and Bacterial Destruction, by R. F. Holland and A. C. Dahlberg (pp. 361-365) (N. Y. State Sta.); A Critical Review of the Phosphatase Test, by L. H. Burgwald (pp. 366-389) (Ohio State Univ.); A Proposed New Common Sense Milk Can, by H. A. Trebler (pp. 399-403); The Single-Service Container and Its Effect on Milk Distribution Costs, by E. L. Vellow (pp. 418-430); Practical Experience With the New Medium in Quality Control, by A. J. Powers (pp. 443-459); The Pigments, Vitamins, and Enzymes of Milk in Relation to Changes in Flavor and Nutritive Value, by D. B. Hand and P. F. Sharp (pp. 460-463) (Cornell Univ.); A New Group of Sterilizing Agents for the Food Industries and a Treatment for Chronic Mastitis, by F. M. Scales and M. Kemp (pp. 491-520); A New Method of Retarding Oxidized Flavor and Preserving Vitamin C—Deaeration, by P. F. Sharp, E. S. Guthrie, and D. B. Hand (pp. 523-545) (Cornell Univ.); Remarks on Homogenized Milk, by I. J. Wolman (pp. 546-550); Cooked Flavor in Milk, A Study of its Cause and Prevention, by I. A. Gould (pp. 553-564) (Mich. State Col.); Simplified Cultural Methods for the Diagnosis of Streptococcal Mastitis, by R. B. Little (pp. 565-570); and Discussion of Dr. Little's Paper, by J. G. Hardenbergh (p. 570).

Objectives of quality committees, W. H. E. REID (*Milk Plant Mo.*, 30 (1941), No. 4, p. 56).—A concise statement by the chairman of the general committee of the American Dairy Science Association.

Economic problems related to the establishment of a uniform high quality raw milk supply, C. L. FLESHMAN. (Va. A. and M. Col.). (*Milk Plant Mo.*, 30 (1941), No. 4, pp. 56-58, 60).—A discussion of certain activities of the subcommittee on market milk of the American Dairy Science Association.

What can be done to improve the quality of milk? H. A. BENDIXEN. (Wash. State Col.). (*Milk Dealer*, 30 (1941), No. 7, pp. 38-39, 94-95).—A general discussion.

A modified resazurin test for the more accurate estimation of milk quality, C. K. JOHNS and R. K. HOWSON (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 320-325).—The proposed scheme provides for the placing of milk in one of four grades, depending on whether the resazurin color is reduced to the single color standard (P 7/4 Munsell notation) in 1, 2, or 3 hr. It is concluded that the "triple reading" test is superior to the "one-hour" resazurin test in the detection of high bacteria and leucocyte counts, and reflects high leucocyte counts much more definitely than do either the resazurin "pink" or methylene blue reduction tests.

Application of the resazurin test in determining the quality of pasteurized cream, W. H. CHILSON and M. A. COLLINS (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 334-340).—Application of the resazurin test to from 20 to 40 percent pasteurized cream consisted in adding 1 cc. of 0.005 percent resazurin solution to 10 cc. of cream and holding at 98° F. The results thus obtained were compared with those secured in incubation tests and standard plate counts. It is concluded that a 6-hr. reduction time of resazurin to a pronounced pink is a criterion of fine quality cream which generally does not exceed 40,000 bacteria per cubic centimeter when aged 4 days at 40° to 45°. A 5-hr. reduction time indicated cream slightly inferior, both in initial and keeping quality, to that having a 6-hr. reduction period. Cream which reduced resazurin in 5 hr. rarely exceeded 100,000 bacteria per cubic centimeter and generally contained less

than 40,000. A 5-hr. reduction period is considered a more accurate criterion of satisfactory quality in cream than a 0.02-percent acid rise upon incubation at 72° for 15 hr. However, the reduction test cannot be depended upon always to pick out high counts in cream which has been stored at 40° or lower for 4 days or more.

Testing the quality of cheese milk with resazurin and methylene blue, E. M. HUTTON and V. R. McDONALD (*Jour. Dept. Agr. So. Austral.*, 44 (1941), No. 7, pp. 361-365, fig. 1).—This contribution from the Roseworthy Agricultural College, Australia, presents results of a series of tests with cheese milks comparing the methylene blue reduction and the resazurin reduction methods. The resazurin test proved to be much more rapid and exacting with particular sensitivity to staphylococcal systems.

Inhibition of lipase activity in raw milk, N. P. TARASSUK and G. A. RICHARDSON. (Univ. Calif.). (*Science*, 93 (1941), No. 2413, pp. 310-311).—Using milk samples susceptible to spontaneous lipolysis it was found that after milk is drawn from the udder the lipase is activated by cooling, whereas the enzyme remains relatively inactive so long as the milk is kept near the body temperature and only slight lipolysis occurs when the temperature remains above 20° C. The rate of lipase action increased with progressive cooling below 20°, and once the milk had been cooled the activity was not materially affected by rewarming. Holding milk at 32°-37° for 1-3 hr. after it was drawn from the udder exerted a marked retarding effect on lipase activity, even though the milk was subsequently cooled. It is suggested that the acceleration of lipase activity in milk by cooling is due to the effect of cooling on the permeability to lipase of the adsorption membrane surrounding the fat globule.

The leucocyte count and the chloride content of milk from bovine udders with mild streptococcic infections, J. F. CONE (U. S. D. A.). (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 341-345).—As a regular procedure, milk samples collected from individual udder quarters of all cows in the dairy herd at 2- to 3-week intervals were subjected to the Hotis test, plating on esculin blood agar, leucocyte count, and titration for chlorides. It appeared that in a group of cows of different breeds and ages and in all stages of lactation the chloride content and leucocyte count of the milk failed to distinguish readily between quarters with very mild streptococcus infection and the uninfected quarters. However, both tests were considered valuable adjuncts to the bacteriological test. An abrupt rise in the chloride content and leucocyte count in the milk strongly indicates the beginning of infection, although the values may not exceed the arbitrary values usually accepted as indicating mastitis. The leucocyte count appeared to be a more reliable index of infection than the chloride content, since the latter was more likely to be affected by factors other than infection.

The early detection of bovine mastitis by an electrometric method, E. C. McCULLOCH. (Wash. Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 314-319, figs. 3).—Based on the principle that mastitis milk conducts electrical currents more readily than does normal milk, a portable electrometric mastitis detector is described. Diagnosis by this method has proved to be rapid, convenient, and reasonably accurate. The results thus obtained showed a high degree of correlation with the results of titration for chlorides in the milk.

Thermotolerant bacteria in pasteurized milk.—II, Studies on the bacteria surviving pasteurization, with special reference to high-temperature, short-time pasteurization, J. L. HILMAN, H. LEESE, and M. L. SPECK (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 305-315).—Following the review of the literature (E. S. R., 84, p. 664), experiments were conducted in which 15 separate

lots of mixed milk from a large plant were each pasteurized by three different methods, (1) 143° F. for 35 min. in the laboratory, (2) 161° for 16 sec. in the laboratory, and (3) 161° for 16 sec. in plant equipment. The average numbers of bacteria per cubic centimeter of pasteurized milk were 13,000, 17,533, and 30,200 under methods 1, 2, and 3, respectively. The higher counts in milk subjected to the high-temperature, short-time pasteurization were largely due to the survival of alkali-producing types of organisms, most prevalent of which were *Micrococcus* *candidus*, *M. epidermidis*, *M. Luteus*, and *M. varians*. These micrococci were found to make up the predominant thermophilic flora of dirty milking machines, strainers, and pails on the farm and about one-half of the thermophilic organisms isolated from milk cans. It appears that the thermophilic micrococci in milk originate primarily in the udders of cows and subsequently grow in improperly cleaned dairy farm utensils.

Oxidized flavor in milk.—VIII, The effect of the degree of saturation of fat in the ration of the cow upon the iodine number of the butter fat and the susceptibility of the milk to metal-induced flavor, W. C. BROWN, R. B. DUSTMAN, and C. E. WEAKLEY, JR. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 265-275, figs. 6).—This series is continued (E. S. R., 81, p. 705). As supplements to a low-fat basal ration cows received 1 lb. per day of either coconut oil or soybean oil over 6-week experimental periods. The iodine number of the purified milk fats and the susceptibility of the milks to copper-induced oxidized flavor were determined. Coconut oil in the ration slightly decreased the iodine number of the fat and reduced slightly the intensity of oxidized-flavor development. Either crude, expeller, or refined soybean oil in the ration greatly increased the iodine number and increased the susceptibility of the milk to the metal-induced oxidized flavor, but apparently the differences in lecithin content of the three soybean oils had little influence on the development of oxidized flavor. Hydrogenated soybean oil slightly increased the iodine number of the resulting butterfat. When the low-fat basal ration was fed, the iodine number of the butterfat showed little relationship to the intensity of oxidized flavor developed. When the rations were varied, approximately 3 weeks were required before the iodine number of the butterfat reached the period of maximum change.

The freezing and thawing of milk homogenized at various pressures, G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 277-287, figs. 7).—Homogenized milk samples, as previously described (E. S. R., 84, p. 239), and other samples heated to inhibit creaming were subjected to 0° F. for 3 hr. A slightly greater percentage of the homogenized than the unhomogenized milks froze under these conditions. In both series the unfrozen portion was relatively richer in fat and solids-not-fat than the frozen portion. In untreated samples in which creaming occurred the frozen portion was higher in fat but lower in solids-not-fat than the unfrozen portion. The titratable acidity of the unfrozen portion was higher than the frozen portion regardless of creaming. The frozen homogenized milk when thawed exhibited a pronounced settling of the fat and solids-not-fat, whereas in the heated milk when frozen and thawed the fat tended to rise to form a cream layer. The drainage of solids was slightly faster after the first 100 cc. from the homogenized than from the unhomogenized milk.

Some factors affecting the body of market cream, F. M. SKELTON and E. O. HERREID. (Vt. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 289-296).—Both normal and washed creams produced at different seasons of the year were included in the study. In many cases the normal raw cream was too viscous to flow, particularly when the cows were on winter feed. The vis-

cosity of both normal and washed cream was reduced by pasteurization, although only slightly in the case of the latter. On aging for 24 hr. normal cream showed a more pronounced increase in viscosity than washed cream. Both normal and washed cream increased in viscosity when subjected to heat treatment—method of Hening and Dahlberg (E. S. R., 68, p. 240)—during the winter, but the responses were less during the summer especially during the period of transition from winter to summer feed. The viscosity of pasteurized cream aged for 24 hr. was not greatly influenced by the transition from winter to summer conditions. A temporary structural condition, resulting from aging or heat treatment, which causes increased viscosity of cream is discussed at length.

Factors affecting the survival of *Streptococcus pyogenes* in cheese, M. W. YALE and J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 6, pp. 326-335).—The length of time *S. pyogenes* would survive in cottage, Limburger, and Cheddar cheese was determined. One percent of an 18-hr. milk culture of *S. pyogenes* was added to the cheese milk in each case. The organism was not recovered from a high-acid cottage cheese several hours after manufacture, and when the curd was reinoculated with the organism it again died off rapidly due to high H-ion concentration. The organism survived between 28 and 51 days in one lot of Limburger cheese containing 42.8 percent moisture and between 9 and 14 days in another lot containing 49.3 percent. The minimum pH of the latter was 4.75. It survived over 18 weeks and between 9 and 11 weeks in samples of Cheddar cheese cured at 45° and 62° F., respectively, while in another lot cured at 50° it survived less than 18 weeks. Variety of cheese, its moisture and salt content, and the curing temperature are important factors affecting the length of survival of *S. pyogenes* in cheese.

Common defects of ice cream, their causes and control: A review, P. S. LUCAS. (Mich. State Col.). (*Jour. Dairy Sci.*, 24 (1941), No. 4, pp. 339-368).—This comprehensive review includes 155 references to the literature.

VETERINARY MEDICINE

[Work in animal pathology by the Nevada Station] (*Nevada Sta. Rpt.* 1940, pp. 30-33, fig. 1).—The work of the year for which data are reported (E. S. R., 83, p. 540) includes hemorrhagic disease in cattle, encephalomyelitis in equines, and equine influenza, all by E. Records and L. R. Vawter; and a study of types of malnutrition, diminished reproductive activity, and lowered resistance to disease in cattle which appear to be due to deficiencies in the content of certain forms of mineral matter in soil, water, and forage, by Records, Vawter, M. R. Miller, and V. E. Spencer.

[Contributions on animal pathology and parasitology] (*N. Y. State Vet. Col. Rpt.*, 1939-40, pp. 83-226, figs. 6).—Among the contributions presented in this report (E. S. R., 84, p. 668) and not previously noted are the following: Suggested Therapy for Albuminuria in Dairy Cows at Parturition, by G. H. Freer and C. E. Hayden (pp. 83-89); The Initiation of Avian Coccidial Infection With Merozoites, by P. P. Levine (pp. 138-143); Mites in the Nasal Passages and Sinuses of Dogs, by W. S. Monlux (pp. 144-147); Bovine Therapeutics, by W. J. Gibbons (pp. 173-176); The Persistence of U. S. B. A. I. *Brucella* Strain 19 in Vaccinated Calves, by E. J. Sunderville (pp. 177-191); and Brucellosis in Horses and Goats in New York State, by W. S. Stone (pp. 192-226).

[Work in animal pathology by the Washington Station] (*Washington Sta. Bul.* 394 (1940), pp. 30-31, 33, 34-35).—Report is made of the work of the year (E. S. R., 83, p. 242) with the poisonous constituents of *Amsinckia intermedia*, by K. Groves; the toxicity of lead arsenate and spray residues to sheep, steers, and pigs, by J. L. St. John and Groves; factors responsible for the development

of mastitis in dairy herds and the efficiency of natural agents of disinfection and of disinfectants commonly used on poultry farms, both by E. C. McCulloch; fowl leucosis and the efficiency of phenothiazine and related products in removing internal parasites in poultry, both by McCulloch and L. G. Nicholson; and swine arthritis, by H. G. McDonald and McCulloch.

[Studies in comparative physiology, pathology, and parasitology in Japan] (*Jap. Jour. Vet. Sci.*, 2 (1940), Nos. 1, pp. 1-101, pls. 6, figs. 2; 2, pp. 139-183, 195-236, figs. 9; 3, pp. 257-339, pls. 6, fig. 1; 4, pp. 375-411, 427-446, 450-464, pls. 10, fig. 1; 5, pp. 475-557, pls. 3, figs. 13; 6, pp. 567-627, pls. 3, figs. 2).—Included in the contributions presented in No. 1 (E. S. R., 83, p. 678) are the following: Experimental Studies on the Infectious Abortion in Mares—VII, The Vaccination With Live Cultures of *Salmonella abortivo-equina* for the Prevention of Abortion, by K. Kasai and K. Hirato (pp. 1-22, Eng. abs. pp. 20-22) (E. S. R., 79, p. 245), and VIII, Studies on Haemolytic Streptococcus Appearing in the Vaginas of Pregnant and Non-Pregnant Mares Inoculated With *Salmonella abortivo-equina*, by T. Nisi (pp. 23-38, Eng. abs. pp. 37, 38); Leptospiroes of Dogs in Japan—I, The Etiology of Stuttgart Disease of Dogs and the Value of Leptospira Serum for Japanese Dogs [trans. title], by S. Yamamoto (pp. 39-74, Ger. abs. pp. 71-74); and On the Experimental Infection With Rinderpest Virus in the Rabbit—II, Pathology, by K. Fukusho and J. Nakamura (pp. 75-101, Eng. abs. pp. 96-101) (E. S. R., 82, p. 250).

Contributions in No. 2 include: Studies on the Antigen of *Pfeifferella mallei*—I, Observation of Reaction Zone Determined by the Antigen-Antibody Union in Complement-Fixation Tests, by T. Nisi and Y. Sibuya (pp. 139-154, Eng. abs. pp. 153, 154); Studies on the Genus *Corynebacterium*, by Y. Ochi and K. Zaizen (pp. 155-183, Eng. abs. pp. 182, 183); and On the Relation Between the Mallein Reaction and the Morphological Changes in 300 Cases of the Glanders Lungs of Mongolian Range Horses, by O. Itikawa (pp. 195-236, Eng. abs. pp. 228-236).

Contributions in No. 3 include: Complement-Fixation Reaction in Rinderpest—VI, Production of Antibody, by J. Nakamura and S. Wagatsuma (pp. 257-276, Eng. abs. pp. 272-276) (E. S. R., 82, p. 250); The Relations Between the Morphological Changes and the Mallein Reaction in 300 Glandered Mongolian Horses With Spleen Lesions [trans. title] (pp. 277-300, Ger. abs. pp. 296-300) and The Relations Between the Nasal Lesions of Glanders and the Mallein Reaction in 300 Glandered Mongolian Horses Sectioned [trans. title] (pp. 301-320, Eng. abs. pp. 317-320), both by O. Itikawa; and Pharmacological Studies on the Autonomic Nerves of the Small Intestine of the Horse—I, Sympathetic Innervation of the Small Intestine, by U. Tanaka and Y. Ohkubo (pp. 321-339, Eng. abs. pp. 338, 339).

Contributions in No. 4 include: Studies on Myiasis of Wild Animals in Manchoukuo—I, On Subcutaneous Myiasis of *Capreolus manchuricus* (Noak), by J. Yamashita and K. Tosa (pp. 375-385, Eng. abs. pp. 384-385); On the *Salmonella typhi-murium* Isolated From Fatal Cases of Acute Gastroenteritis Found Among Imported Sheep, by S. Nohmi, G. Nakajima, and S. Karasawa (pp. 386-411, Eng. abs. pp. 410-411); Contribution to the Knowledge of the Patho-Anatomical, and Histological Changes in the Submaxillary Lymph Nodes of Glandered Horses [trans. title], by O. Itikawa, I. Wada, and T. Hosoda (pp. 427-446); and Supplement to Information About Trematoda Parasitic on Dogs in Kobe, by M. Yosikawa, I. Miyata, and S. Uesugi (pp. 450-464, Eng. abs. p. 464).

Contributions in No. 5 include: Experimental Investigations of the Action of Drugs on Horses—I, Stimulants: (1) Action of Camphor on Horses [trans.

title], by U. Tanaka, Y. Okubo, T. Tamura, and Y. Shiokawa (pp. 475-487, Ger. abs. p. 487); On a Simplified Method of Staining Acid-Fast Bacteria, II (pp. 488-490, Eng. abs. p. 490) (E. S. R., 83, p. 105) and On the Gram-Differentiation of Bacteria by the Simplest Method—III, The Sulfuric Acid Method (pp. 491-496, Eng. abs. p. 496) (E. S. R., 82, p. 250), both by E. Ryu; Studies on the Abortion Salmonellosis Among Horses—I, The Natural Cases of the Abortion Salmonellosis, by K. Fukano (pp. 497-517, Eng. abs. pp. 516-517); On the Specificity of *Streptococcus equi* From View-Point of Fortner's Anaerobic Cultivation, by S. Namikawa, Y. Kurihara, and M. Emori (pp. 518-530, Eng. abs. pp. 529-530); and On the Histo-pathological Studies of Infectious Anemia in Horses: On the Detection of Siderocytes in the Blood of Vena Jugularis and Its Clinical-Diagnostic Value, by S. Ishii, K. Nobuto, and K. Tanaka (pp. 531-557, Eng. abs. pp. 555-557).

Contributions in No. 6 include: On the Experimental Infection With Rinderpest Virus in the Rabbit—III, Neutralization Experiment, by J. Nakamura (pp. 567-578, Eng. abs. pp. 577-578) (see above); Observation on the Bacterial Flora in the Endometritis of Mares, by Y. Kawahara (pp. 579-588, Eng. abs. p. 588); A Simple Method of Spore Staining, by E. Ryu (pp. 589-592, Eng. abs. p. 592); On the Type Differentiation of Hemolytic Streptococci Isolated From Strangles, Pneumonia, and the Other Streptococcal Diseases of Equines—I, The Type Differentiation by the Biological Examination, by Y. Tuji and A. Sato (pp. 593-616, Eng. abs. pp. 613-616); and On a Nematode, *Uncinaria stenocephala* (Railliet, 1884) From Dogs in Chosen, by S. Kato (pp. 617-627, Eng. abs. p. 627).

A text-book of bacteriology, R. W. FAIRBROTHER (London: William Heinemann, 1940, 3. ed., pp. X+451, pls. 6, figs. 12).—In this edition part 1 is devoted to general bacteriology (pp. 1-152), part 2 to systematic bacteriology (pp. 153-418), and part 3 to general technic (pp. 419-442).

The importance of vitamin A in animal life and the effect of its deficiency upon animals, G. H. HART. (Univ. Calif.). (Internat. Assoc. Milk Dealers, Assoc. Bul. 13 (1940), pp. 303-314, figs. 4).

Beach apple or manzanilla poisoning, G. T. PRICE (War Dept. [U. S.], Off. Surg. Gen., Vet. Bul., 35 (1941), No. 1, pp. 30-32).—Report is made of the toxic action upon contact of the plant *Hippomane mancinella* of the family Euphorbiaceae in Panama. Both man and animals are susceptible to its irritant properties.

Effect of sulfanilamide and sulfapyridine on the avian malaras, R. D. MANWELL, E. COUNTS, and F. COULSTON (Soc. Expt. Biol. and Med. Proc., 46 (1941), No. 3, pp. 523-525).—Of three species of avian malaria agents against which sulfanilamide and sulfapyridine were used, including *Plasmodium circumflexum*, *P. relictum matutinum*, and *P. nucleophilum*, only the first mentioned was affected by either drug. *P. circumflexum* was markedly susceptible to sulfapyridine, this drug being capable of aborting the appearance of parasites in the peripheral blood and of causing their rapid disappearance after the infection becomes patent. However, it is less effective than plasmochin, atabrine, or quinine.

Studies in brucellosis. (Partly coop. U. S. D. A. et al.). (Michigan Sta. Tech. Bul. 177 (1941), pp. 55, fig. 1).—A series of nine papers is presented.

A study of factors influencing the isolation, cultivation, and differentiation of the species of *Brucella*, W. B. ARDREY (pp. 3-10).—Beef liver agar containing 0.5 percent Bacto-peptone was found as satisfactory as agar prepared with other peptones for the isolation and cultivation of *Brucella*. A medium containing more than 0.5 percent peptone tends to retard the growth of *Brucella*. "When using beef liver agar containing 0.5 percent Bacto-peptone for isolating *Brucella*

from milk, the crystal violet dye added for the purpose of inhibiting rapid growing Gram-positive bacteria should have a final dilution of 1:700,000. The bacteriostatic action of basic fuchsin and thionin on *Brucella* is influenced by the pH of the medium and the concentration of peptone present. The reduction of the dyes after pouring plates appears to be a property of certain lots of beef liver infusion. Bacto-tryptose agar, a complete peptone medium, is highly satisfactory for the isolation of *Brucella* and for the differentiation of the three species in the presence of dyes."

The presence of a capsule on Brucella cells, I. F. Huddleson (pp. 11-14).—Description is given of a procedure for demonstrating a capsule on *Brucella* cells and other bacteria possessing a capsule. Only the smooth and intermediate forms of the species of *Brucella* have been shown to possess a capsule. It is believed that the greater the amount of capsular substance inside the capsule, the more intense is its color when stained. Data have been obtained which indicate that virulence of a given strain is determined by the presence of a capsule and the amount of capsular material present.

Study of cross skin sensitization between Pasteurella tularensis and Brucella melitensis, R. B. Pennell and I. F. Huddleson (pp. 15-16).—In this study of cross skin sensitization, rabbits sensitized to either *Brucella* or to *P. tularensis* showed no evidence of cross sensitization when skin-tested with a protein nucleate solution prepared from either of the two organisms. Skin sensitization is developed for only the homologous allergic agent. The results suggest that a skin test performed on humans with protein nucleate solution prepared from *Brucella* or from *P. tularensis* should serve as a means of differentiating the two diseases when the clinical diagnosis is doubtful.

The immunizing value of the gluco-lipid antigen from Brucella cells, W. H. Stahl and E. E. Hamann (pp. 17-19).—In the work reported, the gluco-lipid antigenic fraction, prepared from *B. abortus* cells according to the procedure of A. Boivin and L. Mesrobian,³ failed to protect 19 of 21 guinea pigs against experimental *B. abortus* infection. The number of controls which failed to show evidence of infection on autopsy was greater than those in the treated guinea pigs.

Conditions for maximum precipitation and agglutination of antibody in various Brucella antisera, W. H. Stahl and R. B. Pennell (pp. 20-22).—In this study, the details of which are given in table form, the data show that for establishment of a true equilibrium or precipitation of the maximum amount of *Brucella* antibody nitrogen, the following conditions must be maintained: For human antiserum and endoantigen, 4° C. for 48 hr.; guinea pig antiserum and endoantigen, 37° for 24 hr.; goat antiserum and endoantigen (homologous or heterologous), 37° for 2 hr., 22 hr. at 4°; cow antiserum and endoantigen, 37° for 2 hr., 22 hr. at 4°; and for purified and unpurified cow antiserum and gluco-lipid antigen 4° for 48 hr.

To obtain maximum removal of *Brucella* agglutinin antibody nitrogen, it was found necessary to maintain the following conditions: For human antiserum and homologous cells, 37° for 48 hr.; guinea pig antiserum and homologous cells, 4° for 24 hr.; cow antiserum and homologous cells, 4° for 48 hr.; and for goat antiserum and homologous cells, 4° for 48 hr.

The presence of Brucella antibody in the urine of human beings, R. B. Pennell (pp. 23-28).—The urine of certain brucellosis patients was found to contain *Brucella* antibody. Although many urine samples must be examined before a general conclusion can be drawn, the present indications are that anti-

³ Compt. Rend. Soc. Biol. [Paris], 115 (1934), No. 3, pp. 304-306.

body may be present in the urine of brucellosis patients when the prognosis is unfavorable and absent when the prognosis is favorable.

Separation and study of the lipid fraction of Brucella abortus, W. H. Stahl (pp. 29-34).—In a study made of the chemical composition of the lipids of a smooth strain of *B. abortus* they were found to compose about 5 to 6 percent of the weight of the whole dried cells. "The alcohol-ether soluble lipids were separated into approximately 27 percent acetone soluble fat and 73 percent phosphatide. The phosphatide on hydrolysis with aqueous sulfuric acid gave fatty acids, glycerophosphoric acid, and ethanolamine. The presence of choline is postulated. The acetone-soluble fat gave on saponification glycerol and fatty acids. An unidentified crystalline compound containing carbon, hydrogen, and sulfur was isolated from the chloroform-soluble fraction. An examination for so-called 'bound lipids' was made, yielding only a very small amount of glyceride composed mainly of fatty acids with the probable presence of some polysaccharide. The lipids may be chemical constituents of the capsular substance of *Brucella*. The lipids of *Brucella* are biologically inactive."

A study of the leucocytic picture in brucellosis, M. Munger (pp. 35-44).—In the study of *Brucella melitensis*-infected individuals the blood picture was found to reveal a leucopenia with a relative lymphocytosis and slight monocytosis. The red blood cells tend to be slightly smaller than normal; however, some patients gave evidence of macrocytosis. There was an increase of the non-filamented neutrophils over the normal value. The presence of "pathologic lymphocytes" in 40 percent of the brucellosis cases is significant. "Liver endothelial cells" were found consistently in these patients. Finally, varying degrees of "basophilic granulation of the neutrophils" were found in all cases of brucellosis studied. The details of the findings of red blood cell size and leucocytic picture in 32 cases of brucellosis and of the leucocyte picture in 40 cases are presented in table form.

A study of the effect of the toxic fraction from Brucella cells on the leucocytic picture in normal guinea pigs, M. Munger (pp. 45-55).—It was found that a reduction of about 70 percent in the peripheral leucocyte count with a predominant loss of neutrophils occurred from 15 to 30 min. after a subcutaneous injection of a sublethal or lethal dose of the *Brucella* toxic fraction. Different organs of the body contained varied leucocyte counts. The percentages of the different leucocytes were not the same in all organs studied. The loss in peripheral leucocytes could not be accounted for by their migration to the blood vessels of the interior tissues of the body. An extract expressed from pieces of stomach or the small intestine after incubation with the toxic fraction produced in vitro a 50-percent reduction of leucocytes in whole citrated blood. The uric acid content of the urine was increased nearly 260 percent after the injection of the toxic fraction. The data obtained in the study indicate that *Brucella* toxic fraction aided by tissues of the gastrointestinal tract had a cytolytic effect on neutrophils in the blood vessels.

A list of references to the literature accompanies each of the contributions.

Bacterial dissociation in Brucella abortus, C. K. MINGLE and C. A. MANTHEL (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 181-189, 190, figs. 6).—Report is made of the results of preliminary studies of the phenomenon of bacterial dissociation in *B. abortus*, with special reference to strain 19. A broad classification of the dissociative colonial forms observed in strain 19 comprises three main groups: The S (smooth), I (intermediate), and R (rough) types. The existence of other forms of a relatively unstable character in the S to R conversion is recognized. Associated

changes in antigenicity and virulence, as well as slight variations in biochemic activity, become increasingly pronounced as the I to R conversion progresses toward the R stage. An unusual dissociative W form, differing in its colonial and cellular morphology from the usual *Brucella* variants, has been observed in aged vaccine prepared from strain 19. Significant differences exist in the serologic relationship of the W forms as compared with the typical smooth types. Reversion of the W forms to their S prototypes was accomplished by passage through guinea pigs. The reverted types were culturally, morphologically, antigenically, and physiologically comparable with the smooth forms. The value of competent supervision of *B. abortus* vaccine cultures is emphasized, and a basis for such control is established.

Results obtained by long-continued cultivation of *Brucella abortus* in living chick embryos, H. J. METZGER and F. R. STOKES. (N. J. Expt. Stas.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 178-180, fig. 1).—In reporting upon further work (E. S. R., 83, p. 244), repeated egg-to-egg transfers are said to have resulted in certain changes in a virulent strain of *B. abortus* known as strain C. G. Following the thirty-ninth transfer this organism has been growing on artificial media without the addition of carbon dioxide. A comparison of the forty-eighth and fiftieth transfers of this strain with the original C. G. indicates that the organism has lost much of its virulence and of its ability to stimulate the production of antibodies in guinea pigs.

The hereditary transmission of anaplasmosis by *Dermacentor andersoni* Stiles, D. E. HOWELL, G. W. STILES, and L. H. MOE. (Okla. Expt. Sta. and U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 165-166).—Two transmission experiments are reported, the first of which resulted in the successful transmission of anaplasmosis by larvae that hatched from the eggs of a naturally infected tick (*D. andersoni*). The second animal on which larvae from a similar source engorged failed to develop the disease.

On the Kauffman-White classification of *Salmonellas* [trans. title], G. PACHECO and G. A. COSTA (*Mem. Inst. Oswaldo Cruz*, 35 (1940), No. 2, pp. 365-374; *Eng. abs.*, pp. 371-372).

Comparison of growth of *Trichomonas foetus* and *Trichomonas vaginalis* in chick embryos, S. H. McNUTT and R. E. TRUSSELL. (Iowa State Col. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 489-492).—Report is made of the finding that *T. foetus*, as reported by Nelson (E. S. R., 84, p. 824), and *T. vaginalis* can be grown in chick embryos, although the latter is more difficult to maintain and does not grow as profusely as *T. foetus*. It is considered probable that these two protozoa are nonpathogenic under such conditions. *T. vaginalis* was successfully cultured in series in developing chicken embryos for the first time. There appears to be no advantage in maintaining a stock series of such cultures, since the organisms can be maintained more readily in artificial media with much less danger of bacterial contamination and with a richer growth.

Field experiments in Bang's vaccination, M. RABSTEIN and M. WELSH (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, pp. 268-277, fig. 1).—Report is made of an investigation, commenced in 1934, in 11 herds representing average field conditions to determine the value of *Brucella abortus* vaccines in the control or eradication of Bang's disease. The percentage of reactors in the 11 herds varied from 6.5 to 100, with an average of 36.2. The project covered three age groups and included 796 animals, of which 642 were vaccinated between 3 and 8 mo. of age, 89 between 9 and 12 mo. of age, and 65 between 13 and 21 mo. of age. Different commercial vaccines were employed at the start, but in an effort to establish uniformity of procedure, only U. S. D. A. Bureau of

Animal Industry strain 19 vaccine was used after 1935. It is pointed out that this strain consists of a suspension of live *B. abortus* organisms of low virulence in a saline solution standardized so that each 5-cc. dose contains from six to seven billion live organisms. No evidence was obtained that vaccinated calves spread infection to susceptible animals. Since at the end of 5 yr. a positive blood titer caused by vaccination could not be differentiated from one due to active Bang's disease, it is concluded that vaccination between the ages of 4 and 8 mo. will give better results in the establishment of a Bang-negative herd than vaccination at a later age. Animals vaccinated at such an early age lose their titer more rapidly and even in infected herds continue to remain negative to blood tests. It is concluded from the limited number of milk samples tested in the experiment for the presence of *B. abortus* that vaccination of heifer calves with strain 19 vaccine does not result in the establishment of the organism in the udder during lactation.

Bang's disease, with special reference to control by vaccination, B. M. LYON (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 770, pp. 363-368).

Vaccination to control brucellosis in cattle, C. M. HARING and J. TRAUM. (Univ. Calif. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, pp. 278-284).—In work at the California Experiment Station (E. S. R., 78, p. 699), vaccination with U. S. D. A. Bureau of Animal Industry *Brucella abortus* strain 19 has given a high degree of protection as indicated by controlled infection experiments and by a 94.1 percentage of full-term calves in vaccinated animals in field trials among infected herds. This is slightly higher than the percentage in herds free from brucellosis or kept relatively free by frequent blood tests and removal of reactors. In a herd having 44 percent infection the disease completely disappeared following a 6-yr. program of heifer and calfhood vaccination during which the diseased cows were permitted to remain in the herd until economically useless. It is concluded that the tests for agglutinins in the blood serum are desirable not only at the time of vaccination to determine if the animal is infected, but also between 3 and 6 weeks following vaccination in order to measure the antigenic potency of the vaccine. Association of non-pregnant vaccinated heifers with infected and aborting cows may increase the resistance conferred by the vaccine, but such association after the third month of pregnancy has been known to overwhelm the resistance conferred by the vaccine and to induce clinical brucellosis. The length of time agglutinins will persist after vaccination depends on at least three factors: (1) The age at vaccination, (2) whether or not the animal is subsequently exposed to virulent *Brucella* organisms, and (3) the relative proportion of rough (R) and smooth (S) types of organisms in the vaccine used. It may be anticipated that over 95 percent of calves vaccinated before 8 mo. of age will be negative before their first calving. It was found desirable to use strain 19 for calfhood vaccination in certain herds free from brucellosis when there was danger of the introduction of infection. In infected herds the vaccination of nonreacting adult cows may be justified under certain conditions, but no evidence has been revealed to indicate that the vaccination of reacting cows is of value. Vaccines now in use differ in the proportion of smooth (S), intermediate (I), and rough (R) type of organisms. Such differences are accompanied by fluctuations in antigenic and pathogenic power of the vaccine suspensions. Progress is being made in methods to control dissociation and otherwise to improve and standardize the manufacture and use of the vaccine. Until these improvements come into general use, even if there were no other reasons, the authors consider vaccination with strain 19 to be still in the experimental stage.

Effect of novoxil liquid on catarrhal (chronic) mastitis and on *Streptococcus agalactiae* udder infection, L. A. KLEIN, A. L. KLECKNER, and R. O. BILTZ. (U. S. D. A. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 145-151).—The results of the injection of 67 *S. agalactiae*-infected quarters of the udders of 23 cows with novoxil liquid, a colloidal dispersion of silver oxide in a light mineral oil, are noted. Ten of the 23 cows showed clinical symptoms of catarrhal (chronic) mastitis in 19 of the infected quarters. "Novoxil liquid containing 2.5, 3, 5, and 10 percent silver oxide was injected into different udder quarters. Five to 20 cc. of the same concentration was injected 1 to 10 times at intervals of 12, 24, 48, and 72 hr. All but 8 of the cows received a single course of treatment while in milk. Five were given repeated courses of treatment while in milk, and 3 received a single injection during the 'dry' period. The *S. agalactiae* infection was destroyed in 59, or 88.1 percent, of the infected quarters. The infection was destroyed in all infected quarters in 19, or 82.7 percent, of the cows treated, thus freeing them of the infection entirely. Ten, or 52.6 percent, of the quarters showing clinical symptoms of catarrhal mastitis recovered from the symptoms, and the infection was destroyed. The clinical symptoms of mastitis and also the infection disappeared from all of the quarters in 5, or 50 percent, of the cows showing clinical symptoms of catarrhal (chronic) mastitis before treatment.

"The results were satisfactory in the few cows treated with the 2.5- and 3-percent concentration, but the reaction of the udder was not much greater with the 5-percent concentration and the latter was used in most cases as it was assumed that it would be more certain in its effects. Injections at 24-hr. intervals appear to be more effective than at 72-hr. intervals, but only approximately one-third of the cows treated received injections at 24-hr. intervals. Three to five injections were more effective than a lesser number. These statements should not be regarded as conclusive, however, because of the limited number of cows involved. Swelling of the udder and a change in the appearance of the secretion occurred in all cases following the injections, but these changes were only temporary. The greater quantity of the silver injected into a quarter was eliminated in about 5 days following the last injection, but traces were present in the milk for some weeks later."

A preliminary report on the effect of colloidal silver oxide on bovine mastitis, F. J. WEIRETHER, E. O. ANDERSON, R. E. JOHNSON, W. N. PLASTRIDGE, and E. JUNGHER. ([Conn.] Storrs Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 141-144, 145).—Preliminary observations on the influence of colloidal silver oxide on three quarters infected with *Streptococcus agalactiae* indicate that the milk from the treated quarters was rendered free from the common mastitis organism for periods of from 11 to 37 days. It is thought that under the conditions of the experiments the reappearance of this organism in the milk may have been caused by reinfection from without or from organisms which were located in remote lesions within the gland and had escaped the bactericidal action of the silver oxide. One quarter which was affected with coliform mastitis before and for a period of 12 mo. following the first calving received two injections daily for 6 days and became completely normal following the subsequent calving. Injection of colloidal silver oxide caused a mild irritation of the udder when given once a day and a marked irritation when given twice daily. However, none of the treated quarters appeared to be permanently injured. While the results presented are based on preliminary observations, they appear to be sufficiently promising to justify further investigation of colloidal silver oxide as an aid in the control of bovine mastitis.

Studies on control of the liver fluke of cattle in the Hawaiian Islands, J. E. ALICATA. (Hawaii Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 152-164, figs. 7).—In reporting upon the control of *Fasciola gigantica* (El. S. R., 77, p. 521) the author points out that the attack under way includes control of the fresh-water snails (*Fossaria ollula*) which serve as intermediate hosts, protection of animals from infection, and anthelmintic treatment of infected animals. The fresh-water snails may be controlled by the established methods of applying copper sulfate in infested areas and drainage. Fireflies of the genus *Luciola* have been introduced into the Islands from Japan and the Philippines as a possible means of controlling the snails, and are being liberated in suitable localities. The larvae of these insects are carnivorous and utilize fresh-water snails and other soft-bodied invertebrates as food. The fencing off of infected areas in order to prevent animals feeding on vegetation in and from these regions is recommended. Among the several preparations that appear to be suitable in the destruction of flukes in cattle, mention is made of distol, a proprietary drug, administered at the rate of one capsule to each 70 lb. of body weight, the total amount divided into equal dosages and administered over a period of 2 successive days. Kamala also has been found effective in destroying liver flukes when administered at the rate of one capsule (10 gm.) to each 60 lb. of body weight over a 4-day period. Hexachloroethane also appears to be effective in destroying flukes, but it has been found to cause colic when given at high concentrations. This drug was well tolerated and highly effective when mixed with kamala extract and given at the rate of one capsule (10 gm. hexachloroethane and 1.75 gm. kamala extract) to each 70 lb. of body weight over 2 successive days. Twenty-six cows have been treated successfully with this new preparation. Most of the animals which have been treated with distol, kamala, or hexachloroethane and kamala extract combined, have improved in general physical condition. A description is given of an egg-count method for determining the fluke-egg output in fluky cattle.

Enteritis in sheep caused by infection with the protozoan parasite *Globidium gilruthi*, H. MARSH and E. A. TUNNICLIFF. (Mont. Expt. Sta. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 174-177, figs. 8).—Description is given of an enteritis in sheep, accompanied by severe diarrhea and associated with a massive infection of the intestinal mucosa with a protozoan of the genus *Globidium*. This corresponds to the species *G. gilruthi* in morphology, although that species has hitherto been reported as occurring only in the abomasum.

Infectious enterotoxemia (milk colic) of lambs and kids, I. B. BOUGHTON and W. T. HARDY (*Texas Sta. Bul.* 598 (1941), pp. 20, figs. 2).—A description is given of enterotoxemia, commonly known as milk colic or pulpy kidney, in nursing lambs and kids in west Texas. *Clostridium welchii*, type D, an anaerobic, spore-forming, toxin-producing micro-organism, is established as the basic cause. This organism has been isolated and identified by cultural characteristics and toxin-antitoxin typing tests from several clinical cases of the disease. The fact is brought out that the contributing factors and the exact manner in which the disease is caused are not definitely known. Specific antitoxin has been produced and found to protect susceptible lambs in infected pastures. The economic importance and prevention of the disease is discussed.

The treatment of sheep parasites with repeated doses of phenothiazine, J. R. HAY. (Univ. Del.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 462-465).—A comparison of experimental data, the details of which are given in two tables, indicates that repeated treatments of phenothiazine are

more effective for the removal of intestinal parasites of sheep than single treatments. The effectiveness of this method of treatment is questionable for the removal of *Nematodirus* spp. and the large-mouth bowel worm *Chabertia ovina*, but the nodular worm *Oesophagostomum columbianum*, the hookworm *Bunostomum trigonocephalum*, and the common stomach worm *Haemonchus contortus* were very effectively reduced in number. It is concluded that a dosage of 25 gm. of phenothiazine administered at 2-week intervals can be tolerated and will effectively remove the intestinal parasites common to sheep. The gains in weight of the animals receiving repeated doses of phenothiazine have been found to exceed those on single treatment.

A new record of a deer parasite for California, R. F. ANNEXEAUX (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 199-201, figs. 4).—A description is given of the nematode parasite *Onchocerca cervipedis* found lying in channels of the subcutaneous connective tissue removed from the region of the hock joint of a mule deer in Nevada County, and which was thought to be the cause of lameness in deer.

Convulsions in a pig associated with low blood calcium and phosphorus, A. H. CRAIGE, JR., and J. D. BECK (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, p. 315).

Corynebacterial infections of the cervical lymph glands in swine, N. PLUM (*Skand. Vet. Tidsskr.*, 30 (1940), No. 12, pp. 1211-1227).—The geographical distribution of corynebacterial infections and their distribution in the individual herds, diagnosis of the lesion, and experimental studies on the virulence of the organism, particularly for swine, are discussed in this contribution from the State Veterinary Serum Laboratory at København (Copenhagen).

Experiments with crystal-violet vaccine for the prevention of hog cholera, C. G. COLE and C. N. McBRIDE. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 454-457).—Work aimed at the development of a vaccine for use against hog cholera which would afford a safer and cheaper method of immunization than the serum-virus method, in the course of which the crystal-violet vaccine was perfected, is reported upon.

The formula adopted was first used in May 1936, since which time many lots of vaccine have been prepared by the same method, as follows: "To 800 cc. of selected defibrinated hog cholera blood, 100 cc. of a 3 percent solution of disodium phosphate is slowly added while stirring. Next, 100 cc. of a 0.5 percent solution of crystal violet is added in the same manner. The mixture is placed in an incubator and left there for 2 weeks at a temperature of 37.5° C. Bacteriologic examinations are made of the tissues of the pigs furnishing the virus and of the vaccine when it is removed from the incubator. After removal from the incubator the vaccine is kept in a refrigerator."

The interval between vaccine treatment and exposure varied from 2 to 12 mo., the majority of the hogs being exposed at from 5 to 8 mo. In all, 647 hogs from 166 farm herds treated with vaccine prepared by the above-described method have been subjected to immunity tests, of which 535 (about 83 percent) remained normal or showed only a slight reaction. About 12 percent showed severe reactions, and about 6 percent died or were killed in worthless condition. As an example of improvement in results due to the change in procedure, when the practice of treating pigs under 8 weeks of age was discontinued and treatment confined to pigs over that age, death losses following exposure decreased from 11.64 to 3.28 percent. A total of 214 hogs from 55 herds were exposed; 190, or 89 percent, were adequately protected; 10 percent showed severe reactions; and only 1 percent died. While the duration of immunity fol-

lowing treatment with crystal-violet vaccine has not as yet been definitely established, the vaccine seems to protect swine against cholera quite well through the fattening period provided they have not been treated when under 8 or 10 weeks of age.

What can be done about necro? (*Wisconsin Sta. Bul.* 451 (1941), pp. 26-27).—Experimental trials by J. M. Fargo, C. K. Whitehair, and G. Bohstedt with nicotinic acid for the treatment of necrotic enteritis or "necro" of pigs are briefly reported.

Pox in swine, L. H. SCHWARTZ and H. E. BIESTER. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 136-140, figs. 6).—Report is made of an outbreak of pox in pigs from 4 to 6 weeks old showing a rather unusual type of lesion that occurred on a large swine farm in Iowa during the month of September 1940. The virus was isolated and the disease was transmitted to susceptible pigs, but attempts at experimental transmission to other animals were unsuccessful. The pathologic changes observed on the back of the experimental swine resembled those found in the field cases, while those produced on the underline were typical of those caused by pox infections. Under field conditions the disease was apparently spread by insects other than the louse. The symptoms of the disease were mild and the mortality was very low. The virus is immunologically distinct from that of vaccinia. Recovery from this disease produces immunity against subsequent infection but does not immunize against infection from vaccinia virus. This condition is designated provisionally as swine pox.

Experimental transmission of anthrax to the horse and carabao by *Tabanus rubidus* Wied. [trans. title], F. C. KRANEVELD and R. DJAENOEIDIN (*Nederland. Indische Bl. Diergeneesk.*, 52 (1940), No. 6, pp. 339-380, pl. 1, figs. 7; *Eng. abs.*, pp. 374-376).—Following a review of reported work relating to the parenteral transmission of anthrax by insects, accompanied by a list of 36 references, transmission experiments with *T. rubidus*, which is widely distributed in the Dutch East Indies and occurs in great numbers, are reported. The results of these experiments with the horse have shown that a fatal anthrax infection may be readily produced through direct transmission by this tabanid. The two horses that were bitten by a single infected fly died of anthrax, as did two of the three animals that were infected by 5 tabanids. Of four horses exposed to 10 flies, one failed to react, one became seriously ill, and two died of anthrax. Five horses that were bitten by 15, 20, and 80 tabanids, respectively, all died. The experiments with carabao gave far less striking results.

The determination and clinical correlation of variations in the calcium, inorganic phosphorus, and serum proteins of horse blood, A. H. CRAIG, JR., and J. D. GADD (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 227-256, figs. 6).

Brief history of infectious equine encephalomyelitis and related affections in the United States, J. R. MOHLER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 451-453).—A brief chronological presentation.

Infectious equine encephalomyelitis in the United States in 1940, J. R. MOHLER. (U. S. D. A.). (*Jour. Amer. Vet. Assoc.*, 98 (1941), No. 770, pp. 381-383, fig. 1).

Studies on equine encephalomyelitis, F. M. BIRCH. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 221-226, figs. 2).—A report is made of studies that were instituted primarily to ascertain what effect, if any, the repeated passage through susceptible laboratory animals might have upon the behavior of strains of equine encephalomyelitis virus. Seven of eight strains isolated from horses in Iowa during the summer of 1939 (*E. S. R.*, 83, p. 541)

increased in virulence following repeated guinea pig passage. This tendency to gain in virulence was not shown by one strain. The clinical course produced by another strain differed from that caused by the other viruses. All eight of the viruses were typed and shown to be strains of the western equine encephalomyelitis virus. Ether added to virus brain suspensions was viricidal. It is concluded that the previously described method for successful isolation of the rabies virus does not appear to be applicable to the western equine encephalomyelitis virus.

Another case of equine encephalomyelitis in New Jersey pheasants, F. R. BEAUDETTE, J. J. BLACK, and C. B. HUDSON. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 449-450, 451, fig. 1)—Record is made of an additional case of equine encephalomyelitis in pheasants in New Jersey (El. S. R., 83, p. 678). It is considered to be of interest because there were no positively diagnosed cases of the disease in horses during the season.

Studies of chick-embryo-propagated equine encephalomyelitis virus and vaccine: Antigenicity and preservation, M. S. SHAHAN and E. A. EICHHORN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 218-220).—Equine encephalomyelitis virus carried through 226 serial passages in chick embryos and confined strictly to this medium for propagation remained antigenically and pathogenically indistinguishable from the same strain of virus also transmitted through embryos but periodically interrupted by passage through the horse. Desiccation by vacuum of rapidly frozen virus, rapid freezing alone, and desiccation in vacuum by means of P_2O_5 have been tested as substitutes for buffered glycerin solution in preserving virus. Desiccation by P_2O_5 appears to be the most permanent and otherwise effective means of preservation tried. Rapid, complete drying in vacuo over P_2O_5 , and storage under a high degree of vacuum in the refrigerator provided a uniformly infective virus for at least one year, the maximum period of storage tested.

Westward spread of eastern type equine encephalomyelitis virus, R. RANDALL and E. A. EICHHORN (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, p. 448).—Report is made on the occurrence of the eastern type of encephalomyelitis virus in an animal from an area southeast of Brownsville, Tex., taken in April 1941. This indicates that the geographic limitation of the virus entities has been broken down. Sixty horses had recently been reported in the surrounding area as having died of suspected encephalomyelitis.

Syndrome of temporary alveolar pulmonary emphysema (heaves) in the horse following intravenous injection of histamine, W. G. ANDBERG, W. L. BOYD, and C. F. CODE. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, pp. 285-287).—In 11 experiments on 3 horses, histamine injected into the blood stream induced respiratory symptoms indistinguishable from those associated with acute anaphylactic shock and, with the exception of coughing, characteristic of acute alveolar emphysema (heaves).

Data and bibliography on some nitrogenous constituents of normal dog's blood, J. B. ALLISON, H. O. DRESKIN, and M. L. MORRIS. (Rutgers Univ. et al.). (*Amer. Jour. Vet. Res.*, 2 (1941) No. 3, pp. 196-198).

Observations on bartonellosis in dogs in India, H. N. RAY and J. A. IDNANI (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 3, pp. 259-270, pl. 1, fig. 1).—Following a brief résumé of the existing knowledge of *Bartonella*, a detailed description is given of the disease produced by *B. canis* in Indian dogs. The presence of *B. canis* in dogs appears to result in a progressive and fatal anemia accompanied by high thermal reaction.

Treatment of the canine heartworm *Dirofilaria immitis* with fuadin and sulfanilamide, H. W. BROWN and A. J. SHELDON. (Univ. N. C.). (*Jour.*

Amer. Vet. Med. Assoc., 98 (1941), No. 771, pp. 477-481).—Tests made of various doses and combinations of sulfanilamide and fuadin against *D. immitis* in dogs are reported. A 10-day series consisting of sulfanilamide by the mouth and fuadin intramuscularly resulted in the cure of five out of six dogs. A 10-day series of fuadin alone cured two out of four dogs.

Preliminary studies on the blood chemistry of the fox, E. H. SPITZER, A. I. COOMBS, and W. WISNICKY. (Univ. Wis.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 193-195).—The results of a study of the blood chemistry of red and silver foxes undertaken to establish certain of the normal blood indices which might be used as a reference in nutritional and disease studies and for diagnostic purposes are reported. The data obtained demonstrate that the average erythrocyte count for the mature silver fox is 7.97 million per cubic millimeter; the percentage volume of packed red cells is 59 and the hemoglobin concentration is 15 gm. per 100 cc. of blood. Mean corpuscular volume, mean corpuscular hemoglobin, and mean corpuscular hemoglobin concentration calculations are 74.8 cu. μ , 18.77 μ g., and 25.1 percent, respectively. There is a proportional increase with age of the hemoglobin concentration, percentage volume of packed red cells, and erythrocyte counts in the maturing red fox. Age apparently has no significant effect on mean corpuscular volume, mean corpuscular hemoglobin, and mean corpuscular hemoglobin concentration. There appears to be a slight decrease in total inorganic phosphorus as the fox reaches maturity. The data obtained from the red fox can be used in interpreting the blood chemistry of the silver fox.

Diseases of poultry, their aetiology, diagnosis, treatment, and control, E. GRAY (London: Crosby Lockwood & Son, 1940, pp. 198, [pls. 16, figs. 5]).—This practical work appears in 16 chapters and includes a section on the normal anatomy and physiology of the fowl.

[Report of work in avian pathology by the Western Washington Station] (*Western Washington Sta. Rpt. 1940*, pp. 58-60).—The work of the year reported upon (E. S. R., 88, p. 253) included the effect of frequency of changing straw litter on the incidence of coccidiosis in the laying house, fowl pox, and the transmissibility of pullorum disease to hens mated with males which gave a positive reaction to the agglutination test, all by C. E. Sawyer and C. M. Hamilton; and the effect of feeding a 32 percent whey mash on chickens affected with cecal coccidiosis and leucosis in chickens, both by Hamilton.

Poultry diseases and parasites, L. VAN ES and J. F. OLNEY (*Nebraska Sta. Bul. 332* (1941), pp. 90, figs. 36).—This is a revision, with additions, of Bulletin 290, previously noted (E. S. R., 72, p. 843).

Studies on the occurrence, epidemiology, and inter-host relationships of nematode parasites of the chicken (*Gallus gallus*) in Alabama (*Alabama Sta. Rpt. 1939*, p. 41).—Studies by R. O. Christenson are noted.

A practical dilution-egg-count procedure, J. H. WHITLOCK. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 466-469, figs. 5).—A modification which seems to eliminate many of the undesirable features of the original Stoll egg count is described. The advantages of this technic are that the eggs are concentrated in a fairly small area, separated from most of the fecal debris, and easily and rapidly counted by even comparatively inexperienced workers. The use of this count is advocated as a practical aid to diagnosis and as a check on the efficiency of anthelmintics.

Dried skim milk and other supplements in the ration during caecal coccidiosis of chicks, E. R. BECKER and P. C. WATERS. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc.*, 40 (1939), No. 3, pp. 439-442).—The four experiments reported have furnished further evidence (E. S. R., 80, pp. 530, 687) of

the unfavorable effect of dry buttermilk in the ordinary type of growing ration when White Leghorn chicks become infected with sizable doses of *Eimeria tenella*. It is now also shown that dry skim milk has an effect similar to that of dry buttermilk. It made little difference when soybean oil meal (expeller process) was substituted for a considerable part of the meat element in meat scraps, or when a fine grade of low-temperature sardine meal was substituted for dry milks. Further, it was brought out in chicks on two different rations that there was no difference in mortality from infective inoculations of 100,000 and 200,000 oocysts.

Studies on certain filtrable viruses.—III, Longevity of chorioallantoic and comb-tissue fowl-pox virus in vitro, C. A. BRANDLY, R. GRAHAM, and C. C. MORRILL. (Univ. Ill.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 190-192).—In continuation of studies by Brandly and Dunlap (*E. S. R.*, 82, p. 109) evidence is presented to show that drying of fowl pox virus at room temperature in vacuo apparently lengthens the survival time of the virus in vitro when stored at a temperature of 0°-4° C. as compared with that resulting from drying at room temperature without vacuum. No appreciable difference in antigenic properties was observed in viruses stored for 24 mo. in vacuo and at atmospheric pressure at 0°-4° after drying in vacuo at room temperature. No advantage of dehydration at the sublimation temperature of dry ice over dehydration at room temperature appeared within a period of 24 mo., as judged by viability. In four instances the longevity of the comb-tissue virus was greater than that of the parallel chorioallantoic virus; in one instance the reverse was true. The egg-propagated virus would, nevertheless, seem to be a superior product to the comb-lesion virus in view of the advantages observed by Brandly and Dunlap in previous studies, namely, greater concentration and freedom from bacterial contamination.

An atypical type of *H. gallinarum* (infectious coryza) infection in chickens, J. P. DELAPLANE and H. O. STUART. (*R. I. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 771, pp. 501-502).—This is a case report that calls attention to a type of clinical *Hemophilus gallinarum* infection differing from that ordinarily observed and described. It also emphasizes the value of inoculating susceptible birds and of bacteriologic methods in the diagnosis of respiratory diseases of chickens, since in this instance the inoculation of the suspected exudate in the nasal passages brought about the typical picture of *H. gallinarum* infection as it affects the upper respiratory tract in contrast to the fact that had the suspected exudate consisted of infectious bronchitis virus such reactions would not have been observed. In the latter disease, a coryza may appear several days following inoculation, but facial swellings have not been observed to occur with this virus except in baby chicks.

A comparative study of pullorum disease in barred Plymouth Rock and New Hampshire Red chickens, E. P. JOHNSON. (*Va. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 769, pp. 301-303).—The author found in a comparative study of the susceptibility of Barred Plymouth Rock and New Hampshire Red breeds of chickens to pullorum disease that "99 Barred Plymouth Rock chicks out of 100 and 98 New Hampshire Red chicks out of 90 could be raised until 8 weeks of age, and that all were free from pullorum disease as indicated by a negative reaction to the standard tube agglutination test at the age of 5 mo.

"Exposure to pullorum infection at the age of 5 mo. by placing two reacting chickens with a group of 22 Barred Plymouth Rock pullets and a group of 24 New Hampshire Red pullets, and by placing two 30-cc. portions of a 24-hr. broth culture of *Salmonella pullorum* in the drinking water used by these birds,

over a period of about 2 weeks, resulted in infection, according to results of periodic agglutination tests on the serums of these birds until they were past 14 mo. of age, as follows: Two out of 22 Barred Plymouth Rock birds became infected and 10 out of 24 New Hampshire Red birds became infected. This difference in susceptibility of the two breeds to pullorum disease is statistically significant."

Macroscopic differentiation of lesions of histomoniasis and trichomoniasis in turkeys, E. A. ALLEN. (U. S. D. A.) (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 214-217, figs. 3).—The author differentiates three types of liver lesions found in cases of enterohepatitis in turkeys as follows: Liver lesions resulting from pure infections of *Trichomonas gallinarum* are irregular in outline, granular in appearance, and level with or slightly elevated above the surface of the liver. Lesions produced by pure infections of *Histomonas meleagridis* are more or less circular, have narrow, distinct borders enclosing weblike formations of necrotic material, and are slightly depressed below the surface of the liver. Lesions in livers of turkeys having natural mixed infections of *T. gallinarum* and *H. meleagridis* are relatively large, circular, markedly depressed areas, with slightly raised granular borders and sometimes with granular centers. Since under natural conditions these infections may occur separately or combined, an accurate diagnosis based on differentiation of lesions is important.

Turkeys have own carriers of pullorum; eradication program outlined for breeders, G. S. HARSHFIELD (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 2, pp. 8-9).—Some of the loss that occurs each spring among turkey poults in Colorado during the first weeks of brooding has been found to be due to pullorum disease. Outbreaks have occurred in turkey poults which have never contacted chickens, and bacteriological examination of the parent stock has shown that the cycle of this disease in turkeys is the same as in chickens. The tube test has been found quite satisfactory in detecting the infection in the turkey, but the whole blood-stained antigen identifies only a small percentage of such infected turkeys.

In the program of testing and inspection of flocks commenced at the beginning of the 1939-40 season, 80 flocks, containing a total of 28,810 birds, were tested on the first test of which 40 flocks, totaling 20,092 birds, harbored reactors. Twenty-four of these 40 flocks were cleared of infection by retests and culling during that season. The infection was reduced from 2.9 percent at the beginning of the season to 0.6 percent on the last test. In 1940-41, 81 percent of the flocks, totaling 81 percent of the turkeys, were free on the first test. The infected flocks have either been sold or cleared by retests, so that now all the flocks supplying eggs have the status of pullorum-passed grade.

The eating of infected eggs and fecal contamination of feed and water have been the most important of the several factors that hinder eradication by retests.

Swine erysipelas in turkeys, A. S. ROSENWALD and E. M. DICKINSON. (Oreg. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 202-213, figs. 3).—A study of 16 outbreaks of *Erysipelothrix rhusiopathiae* infection in turkeys during a 3-yr. period indicates that the epizootology of this infection in that fowl is highly erratic. The outbreaks occurred during the months of October, November, and December, with but one exception. The vast majority of the birds affected were males (82.1 percent). The most pathognomonic lesion was a turgid, reddish-purple caruncle. The lesions most consistently encountered were intramuscular and subpleural ecchymotic and suffusion hemorrhages. These lesions, however, were not confined exclusively to this infection. Diagnosis of erysipelas depended on isolation and identification of the causative organism.

Laboratory and field trials indicate that commercial anti-swine-erysipelas serum has no practical value as a treatment or prophylactic in the control of erysipelas infection in turkeys. Segregation of sick birds and slaughter of well birds seemed to be the most economical method of handling these outbreaks.

Parasitic protozoa and their role in the fluctuation of the hazel grouse (*Tetrastes bonasia* L.) population in the northern part of the Gorkij Province, I. M. OLIGER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 28 (1940), No. 5, pp. 470-473, fig. 1).—An investigation of the parasitic fauna of the hazel grouse conducted by the author during the period 1937-40 in the northern part of the province of Gorkij is reported upon. During the period a total of 242 birds, both old and young, were investigated.

Control of "nose-picking" form of cannibalism in young closely confined quail fed raw meat, C. C. BASS (*Soc. Expt. Biol. and Med. Proc.*, 40 (1939), No. 3, pp. 488-489).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Alabama Station] (*Alabama Sta. Rpt. 1939*, p. 9).—F. A. Kummer reports briefly upon the dynamic properties of soils as applied to the elements of implement design, including comparative tests with different plow shapes and materials.

[Agricultural engineering investigations by the Nevada Station]. (Partly coop. U. S. D. A. et al.). (*Nevada Sta. Rpt. 1940*, pp. 29-30, 33-34).—The report notes improvement in the accuracy of prediction of summer stream flow in the Humboldt River, by J. E. Church and C. Elges; and an inventory and history of the water resources of the Truckee, Carson, and Humboldt Rivers, and minor river basins, by G. Hardman and H. G. Mason.

[Agricultural engineering investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1939*, pp. 13, 18-19).—This report notes a run-off sampling and measuring device, described by A. L. Kennedy and K. B. Sanders; equipment for handling legumes, by M. A. Sharp; and a portable machine producing the semblance of rainfall, by Kennedy.

[Agricultural engineering investigations by the Washington Station] (*Washington Sta. Bul. 394* (1940), pp. 13-14, 104).—Work on mazda lamps as a source of heat in electric pig brooders, artificial lighting of sweet peas, evaporative cooling of houses and hen houses, locker storage plants, walk-in cooler and refrigeration units, duration and intensity of artificial light for egg production, and electrocutors for codling moth is briefly noted by L. J. Smith. Experiments by D. J. Crowley at the Cranberry-Blueberry Substation on a sprinkler irrigation system for cranberries are noted.

[Agricultural engineering investigations by the Western Washington Station] (*Western Washington Sta. Rpt. 1940*, pp. 13-15).—In experiments by M. S. Grunder, the chimney principle was successfully applied for the ventilation of stacks of undecured hay built up around open wooden frameworks or around a sheet-metal cylinder withdrawn after completion of the stack.

Water levels and artesian pressure in observation wells in the United States in 1939, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Paper 886* (1940), pp. V+933, figs. 34).—The present report gives records of water level or artesian pressure in about 5,500 observation wells in 35 States and the Territory of Hawaii obtained by the Geological Survey and cooperating Federal, State, Territorial, county, and local agencies.

Geology and ground-water resources of the Lufkin area, Texas, W. N. WHITE, A. N. SAYRE, and J. F. HEUSER (*U. S. Geol. Survey, Water-Supply Paper 849-A* (1941), pp. IV+58, pls. 2, figs. 2).—A survey of the area.

Summary of records of surface waters of Washington, 1919-35 (*U. S. Geol. Survey, Water-Supply Paper 870* (1940), pp. VI+456, pls. 7).—The summaries presented bring together data from 48 water-supply papers with a bibliography to facilitate reference to more detailed information for each station.

Effect upon ground-water levels of proposed surface-water storage in Flathead Lake, Montana, R. C. Cady (*U. S. Geol. Survey, Water-Supply Paper 849-B* (1941), pp. III+59-81, pls. 8).—The study here reported was made to determine the effects of a proposed regulation of the level of the lake upon ground-water levels in the deltalike alluvial plain area, about 25 sq. miles, at the northern end or head of the lake. Some tracts will be rendered unfit for agriculture owing to the rise of the water table, some tracts will become marginal, some may even be improved, but most of the land will be unaffected by the rise.

The uniformity of application of water by sprinkler systems, J. E. CHRISTIANSEN. (Univ. Calif.). (*Agr. Engin.*, 22 (1941), No. 3, pp. 89-92, figs. 7).—The author shows that, although the uniformity of distribution of water from sprinklers varies greatly with pressure, wind, rotation of sprinkler, spacing, and many other factors, a nearly uniform application is possible with proper sprinkler patterns and with proper spacing of sprinklers. Approximately conical sprinkler patterns, in which a maximum application occurs near the sprinkler and decreases gradually to the edge of the area covered, produce a uniform application when sprinklers are not farther apart than 55 or 60 percent of the diameter covered. For wider spacings a pattern for which the application is uniform for some distance from the sprinkler and then tapers off gradually is better, but the degree of uniformity obtainable decreases with increase in the spacing for all spacings greater than 50 percent of the diameter covered. For spacings greater than 50 percent of the diameter and with equivalent areas covered by each sprinkler, a more uniform application can be obtained with an equilateral triangular arrangement of sprinklers than with a square or rectangular arrangement. The uniformity of application varies more with a variation in sprinkler spacing in a triangular arrangement of sprinklers than in a square or rectangular one. In using a portable system and with sprinklers producing desirable patterns, good distributions can be obtained when the line is moved not farther than from 50 to 70 percent of the diameter covered by a sprinkler, and when the spacing of sprinklers along the line is not more than 35 percent of the diameter covered.

A combination suspended-load sampler and velocity meter for small streams, A. G. ANDERSON (*U. S. Dept. Agr. Cir. 599* (1941), pp. 27, figs. 13).—The author describes a combination suspended-load sampler and velocity meter which consists essentially of two tubes fitted through a rubber stopper and inserted into an ordinary pint milk bottle. Details of the instrument, which is unusually simple in construction and comparatively easy to use, are shown in drawings and photographs. Water and sediment enter through a lower tube, and the air in the bottle is forced out through an upper tube, which is bent backward over the bottle in the direction of the stream flow. Both tubes are bent slightly upward inside of the bottle to increase the volume of sediment-laden water that may be trapped and to reduce to a minimum the constant static head that exists between the inside end of the water tube and the outside end of the air tube. A small static head is desirable to overcome the effect of waterdrops that may collect in the air tube when the sampler is being lowered in streams of low velocity and to counteract to some extent entrance losses. The tube, through which the water enters, projects forward from the stopper a sufficient distance to minimize the effect of the container

upon the flow near the entrance of the tube, but not so far as to alter appreciably the compactness of the sampler. Means for attaching a number of the sampler bottles to a support of $1\frac{1}{2}$ - by $\frac{3}{16}$ -in. strap iron are also shown, and the calibration for velocity determination, the depth correction, and the operation of the device are discussed, together with the hydraulics of such a combination sampler and meter as worked out theoretically and by means of experiments in a small circulating flume operated at known suspended load and current velocity. The construction of the flume is shown in plan and section drawings.

A home-made planimeter, H. MATSON. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 3, pp. 94, 109, figs. 2).—The author describes the construction and use of a very simple instrument made from a single piece of $\frac{3}{16}$ -in. drill rod about 14 in. long. He obtained results showing less than 2 percent error when the instrument was manipulated with ordinary care.

Tests of tillage tools.—III, Effect of shape on the draft of 14-inch moldboard plow bottoms, I. F. REED. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 3, pp. 101–104, figs. 10).—Continuing work on tillage devices previously noted (E. S. R., 79, p. 257), the author reports experiments with five major variations of plow-bottom shapes in three soil types and with minor variations in the design of these principal types. The five main types studied were a sod or prairie breaker, a conventional general-purpose plow bottom, a general-purpose tool with a simplified share and radial moldboard, a stubble or sandy-land tool, and a slat-curvature type similar to the stubble type. Drawings of the contours of the plow bottoms on quadrille-rule backgrounds, scaled at 2 in. to the square, accompany the paper.

Utilization of farm residues, R. P. BEASLEY. (Univ. Mo.) (*Agr. Engin.*, 22 (1941), No. 3, pp. 95–96, figs. 3).—Various methods of breaking or cutting cornstalks and of stacking them for decomposition by the addition of ammonium sulfate, superphosphate, and limestone were tested. Some treatment of this sort was found necessary, since plowing the stalks under produced an undesirably loose seedbed and a nitrogen depletion due to their wide carbon:nitrogen ratio.

Combine harvesters in Missouri, M. M. JONES and R. P. BEASLEY (*Missouri Sta. Bul.* 426 (1941), pp. 27, figs. 3).—Surveys following the harvests of 1937, 1938, and 1939 showed that a large majority of the 182 owners found combines to be economical and satisfactory in operation. The average acreage of grain cut per day varied from 76 acres for 40-in. combines and 13.8 acres for 5-ft. machines to 25.3 acres for 12-ft. machines. The maximum acreage of wheat and oats that a farmer should expect to cut per year was estimated by the owners to be 125 acres for 40-in. machines, 236 for 5-ft. machines, and up to 388 acres for the 12-ft. sizes. Custom work accounted for about one-third to one-half of the total work done and proved satisfactory in general both to combine owners and to farmers hiring the work done. The average time lost per season on account of break-downs was only 6 hr. Repair costs varied from 2 to 5.5 ct. per acre.

The cost of combining was affected most by the total acreages harvested per year. Records of 53 5-ft. machines showed from 78 ct. per acre for between 401 and 450 acres per year to \$2.19 per acre for less than 100 acres per year. The average cost for the 5-ft machines was \$1.24 per acre, and the average acreage harvested per season was 238. Tables of estimated costs of combining for various sizes of machines harvesting various acreages per year are given. Comparisons are also made with estimated costs of the binder-thresher method

of harvesting. The cost of combining with 40-in. combines pulled by one-plow tractors under average conditions is estimated to vary from \$1.64 to \$3.03 per acre, with 5-ft. combines pulled by two-plow tractors from \$1.14 to \$3.90 per acre, and with 10-ft. combines from \$1.22 to \$3.61. The cost with the binder-thresher method was from \$2.98 to \$3.75 per acre.

Reducing power waste in operating cotton gins, V. L. STEDRONSKY, T. L. RAGGETTE, and A. J. JOHNSON (*U. S. Dept. Agr. Cir. 601 (1941), pp. 20, figs. 9*).—Following a brief introduction and statement of the methods used in computing power consumption, the authors discuss power losses due to improperly designed piping and separators, replacement of separators by a Rembert-type fan discharging the cotton into a blow box or 30° angle screen box, fans (correct speeds, proper size and design, care, etc.), more efficient seed-handling methods, replacement of plain or ring-oiling bearings by ball or roller bearings wherever possible, and avoidance of excessive tightness of seed rolls, too low a saw speed, or, in brush gins, incorrect brush settings, and other causes of inefficient power use.

A small electric milk pasteurizer, G. J. BURKHARDT and C. W. ENGLAND (*Md. Expt. Sta.*). (*Agr. Engin.*, 22 (1941), No. 3, pp. 107–109, figs. 5).—The authors describe a batch-type pasteurizer intended for holding the milk at 143.5° F. for 30 min. The resistance heat developed by an alternating current passing through the milk itself is used, the electrodes being of graphitized carbon, 12 by 10 in. and 0.75 in. thick. The agitator is driven at 130 r. p. m. by a small electric motor. The unit described handles a 72-gal. batch and has a maximum current demand of 31 a. at 220 v. The vat used for this pasteurizer is steel lined with synthetic rubber and is 24 by 13.5 by 10.5 in. inside.

Methods of field curing hay, T. N. JONES, O. A. LEONARD, and I. E. HAMBLIN (*Mississippi Sta. Bul. 353 (1940), pp. 27, figs. 23*).—In addition to findings noted from another source (*E. S. R.*, 82, p. 264), "light, temperature, oxidative enzymes, copper, pH, relative humidity, and the rate of drying were found to affect the manner carotene is lost from hays or hay plants."

Development of machinery for harvesting and storing grass silage, H. E. BESLEY, C. EBY, and W. R. HUMPHRIES (*Ooop. U. S. D. A.*). (*New Jersey Stas. Bul. 689 (1941), pp. 28, figs. 28*).—This is a more or less popular account of time- and labor-saving equipment and practices found practical in the mowing, raking, loading, cutting, and filling of the wide range of crops and crop combinations (legumes, cereals, and grasses) used in the preparation of "grass silage" in the Northeastern States. The need for loaders, etc., of a construction stronger, because of the approximately three times greater weight of the material dealt with, than is necessary for handling cured hay is pointed out. Test runs on an experimental built-in conveyor for elevating field-chopped grass indicate significant economy of power and labor as compared with present practices.

The design of farm freezing units, R. L. WITZ (*Purdue Univ.*). (*Agr. Engin.*, 22 (1941), No. 3, pp. 105–106, 109, figs. 2).—The various factors requiring consideration in the design of farm freezing units are briefly pointed out, and the construction of a top-opening freezer cabinet designed by the author is shown in a drawing and brief description.

Refrigerator cars as farm storages, H. A. CARDINELL (*Michigan Sta. Spec. Bul. 308 (1941), pp. 38, figs. 14*).—The experiments here reported supplement ice-refrigeration experiments in refrigerator cars carried out in 1937 (*E. S. R.*, 79, p. 690). In the 1938–39 tests, dealt with in this bulletin, two identical cars were used, one being cooled by ice, with some use of salt, and with fans

to drive the cooled air to the top of the storage space. The other car was refrigerated by a mechanical unit consisting of two fin coils carrying "Freon-12" (dichlorodifluoromethane) as refrigerant with a 2 hp. compressor.

The 2-hp. refrigeration unit was not adequate, being continuously overloaded in handling 2,000 bu. of peaches and apples. The power requirement was 4,666 kw.-hr. The calculated cost was 13.5 ct. per bushel, power cost being computed at 1 ct. per kilowatt-hour. The iced car refrigerated 2,700 bu., used 58 tons of artificial ice, and showed a calculated cost of 13 ct. per bushel. Because of the overloading, spoilage and ripening in storage increased much faster in the mechanically cooled car than in the ice cooled. Water to maintain humidity was not supplied to either car, and, though high humidity was observed in both cars, the fruit in the mechanically cooled car shrank badly from dehydration.

Calorimetric measurements of the heat of respiration of fruit and vegetables. W. P. GREY, W. V. HUKILL, and D. H. ROSE (*U. S. Dept. Agr., Tech. Bul. 771 (1941), pp. 22, figs. 6*).—The authors describe a calorimeter constructed for measurement of the heat produced by fresh fruits and vegetables, supplementary apparatus used in conjunction with the calorimeter to determine the carbon dioxide produced by the fruit or vegetable in the calorimeter, and the method used for measurement of the heat of vaporization of water given off by the fruits and vegetables. Values for calculated and measured heat at 45° and 65° F. are given for apples, strawberries, oranges, lettuce, peas, potatoes, and carrots. The data indicate that for most of the fruits and vegetables the values for the heat produced obtained by calculations based on the rate of production of carbon dioxide are within 10 percent of those obtained by means of the calorimeter herein described.

Temperatures of wheat in experimental farm-type storages. C. F. KELLY. (Coop. N. Dak., Kans., Ill., and Md. Expt. Stas.). (*U. S. Dept. Agr. Cir. 587 (1941), pp. 61, figs. 23*).—A detailed study of the temperature of wheat stored in structures of various sizes (from 20 to 1,000 bu.) and type of Fargo, N. Dak., Hays, Kans., Urbana, Ill., and College Park, Md., is described, and the monthly average wheat temperatures found at the bin centers and 6 in. from the north and south walls are recorded.

Atmospheric conditions and bin size and type were found to be the most important factors influencing the temperature of dry wheat. The periods of average air temperatures above 70° F. at Hays were 2.5 times as long, and at College Park and Urbana about twice as long, as at Fargo. These temperature differences were reflected in the wheat temperatures. The size of unventilated bins of similar construction in the same locality was found to determine the lag of the temperature of dry wheat behind the air temperature. The insulation value of a bin wall was found to be an important factor in determining the temperature of the outside layers of wheat but not that of the interior. Shading bins proved effective in preventing outside heat from raising the wheat temperature. Bin ventilation was the most effective method of dissipating heat generated in the wheat mass. Insulation of a storage structure may be an advantage in preventing dry wheat from reaching high temperatures, but if the temperatures finally reached are such as to start excessive internal production of heat, insulation is a decided disadvantage. Storage in underground bins is advantageous in maintaining a low temperature in wheat placed in the bin at a low initial temperature or when the wheat moisture content is low enough to make the generation of large amounts of heat

improbable. Wheat placed in underground storages at a high initial temperature, however, may deteriorate before cooling to safe temperatures.

A sectional wood grain bin, R. A. GLAZE (*Agr. Engin.*, 22 (1941), No. 3, pp. 93-94, figs. 10).—The author describes the construction of a dodecahedral building designed for prefabrication of side and roof sections and to have the advantages of floors and walls tight enough to prevent spoilage from moisture; a floor safe from rodent damage and of low-cost materials obtainable at any lumberyard; a wall section suitable for prefabrication and light enough to permit easy handling; elimination of hoops, bands, etc., commonly used to resist the pressure of the grain; a tight sectional roof, easily assembled; a low-cost wooden ventilator; and low over-all cost, with construction from available lumber stocks. Photographs showing nine stages in the assembling of a bin having 8-ft. sides and a capacity of 1,200 bu. are reproduced, together with a section drawing of a side-wall joint.

Foundations for farm buildings, T. A. H. MILLER and E. G. MOLANDER (*U. S. Dept. Agr., Farmers' Bul. 1869* (1941), pp. II+45, figs. 43).—The authors discuss the selection of a suitable site on the basis of soil characteristics, test borings, and soil-bearing values; footings, including depth below grade, area of footings, thickness, and bonding; types of foundations (continuous walls, piers, precast concrete posts, concrete-slab floors, and timber foundations); cellar walls; construction of foundations; remodeling and repairs, including moving buildings among other operations; and designing foundations, including computation of dead and live loads.

The use of poles in the construction of poultry range shelters, H. D. POLK (*Mississippi Sta. Cir. 101* (1941), pp. 7, figs. 3; also in *Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 3, pp. 2, 5, figs. 3).—Shelters made from peeled pine poles and from sawed lumber, large enough to accommodate 60 pullets to laying age or 100 broilers to marketing age, are described and illustrated. The estimated cost of the pole structure, with roof covering made from sacks treated with a cement-lime mixture (for which a formula calls for the additional use of salt and alum), is \$1.94, while the sawed-lumber shelter, with corrugated metal roof, is estimated to cost \$14.06. A wood subfloor, recommended to be added to the pole shelter, is estimated to cost \$1.50 additional.

A range shelter with galvanized iron roof, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 209* (1941), pp. 52-53, fig. 1).—The authors briefly describe the construction of a 10- by 12-ft. shelter differing from those previously designed at the station in that it is roofed with corrugated galvanized iron. The shelter is dimensioned for from 100 to 125 pullets and may be moved on removable skids or by loading onto a wagon or truck. Six roosts run lengthwise.

A new portable colony brooder house, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 209* (1941), pp. 54-55, fig. 1).—The use of corrugated 28-gage galvanized iron roof and siding served to decrease the weight of a 10- by 12-ft. house by 500 lb. as compared with the use of lumber. A gable roof with side walls 4 ft. high decreased the space inside 9 percent as compared with that of a house with a shed roof 5 ft. high in the rear and 7 ft. high in front. Durability and minimum original and maintenance costs were primary objectives in the design described. Plans and bills of materials for this and for the structure described in the article above noted are available from the station.

Homemade lamp brooder, D. F. KING (*Alabama Sta. Leaflet 19* (1941), pp. 4, figs. 5).—This publication contains working drawings and directions for a simple, economical, easily constructed brooder for 50 or less chicks.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul.* 209 (1941), pp. 79-81, 83).—A brief article, Comparison of Market Outlets Used for Milk in Two Ohio Market Areas, by R. W. Sherman, includes and discusses a table showing for the Columbus market area and the Akron and Canton areas the number and percentage of farms and the percentage of dairy cows by market outlets—producer-distributor; fluid milk to distributor, for Swiss cheese, for other manufacture; butterfat; and nonclassified. The table of index numbers of production, prices, and income, by J. I. Falconer, is brought down through December 1940.

[Agricultural adjustment, with special reference to grassland agriculture] (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 379-419).—Included are papers on The War and Our Changing Agriculture, by E. Englund (pp. 379-390); Farm Adjustments To Meet War Impacts, by S. E. Johnson (pp. 391-402); and Relation of Industry to Agriculture, With Special Reference to Defense and the Lower Third, by L. H. Bean (pp. 403-413) (all U. S. D. A.), presented as part of the symposium on War and Agricultural Adjustments, With Special Reference to Grassland Agriculture, at the meeting of the American Society of Agronomy and the Soil Science Society of America at Chicago, Ill., December 6, 1940, and on Economic Effects of More Roughage Output in the Corn Belt, by T. W. Schultz (pp. 414-419) (Iowa State Col.), presented at the Grassland Conference held at Ames, Iowa, September 11, 1940.

World wheat survey and outlook, May 1941, H. C. FARNSWORTH (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 17 (1941), No. 8, pp. [2]+387-420, figs. 5).—Continuing the series (E. S. R., 84, p. 685), in Europe strenuous efforts have been directed toward stretching current food supplies, including wheat, and toward accomplishing the longer-range task of making the Continent self-sufficient in basic foods. In the overseas exporting countries, especially North America, steps have been taken to provide adequate storage for existing wheat surpluses and to prevent their further expansion during the next two crop years. However, unless the 1941 world crop should prove considerably smaller than anticipated it is thought that world wheat supplies will again be of record size in 1941-42.

An economic study of land utilization in New Castle County, Delaware, R. O. BAUSMAN (*Delaware Sta. Bul.* 228 (1941), pp. [2]+74, figs. 28, map 1).—The climate, soils, markets, trends in production, and distribution of important crops and kinds of livestock and livestock products are described. The lands of the county are classified into four classes with subclasses on the basis of use, type of soil, condition of buildings, and crop yields, and each is discussed. Analyses are made by land classes of (1) size of farms and use of land, capital investment, productive man-work units, and numbers of livestock per farm; (2) age, birthplace, former place of residence, experience of farmers, size of families, education of children and occupation of mature children, and time devoted by farmers to work off the farm; (3) the types of farms in the different land classes and by road groups of the farms and rural residences and their concentration per mile of road, farm capital per mile, and relation of hard-surface roads to amount of livestock; and (4) number of farms having electric power and telephone service in the different land classes.

Economic conditions and problems of agriculture in the Yakima Valley, Washington: The Yakima-Tieton irrigation district, E. B. HURN and H. F. HOLLANDS. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 393 (1940), pp. 56, figs. 11).—This second bulletin of the series (E. S. R., 82, p. 268) makes a more

detailed analysis of the Yakima-Tieton irrigation district. It is based on the crop census for 1936 and other records of the U. S. Department of the Interior Bureau of Reclamation. The trends in crop acreage; irrigable area and water right costs; evolution of present size of farms; the farm organization—size of farm, crop specialization, type of farm, tenure, amount of livestock, etc.; water use and costs; labor supply and requirements; etc., are discussed. An appraisal is made of the present farm organization, and the adjustments needed and the significance of experience in the district are discussed.

Consolidation and enlargement of farms, adjustment in land values on land with income-producing capacity, and the diversification of land use are among the adjustments needed in the district. On the basis of the experiences of Tieton district, it is suggested that in new areas farm units be established on the basis of natural boundaries, that size of unit be governed by productivity of the land and its adaptability to different crops, etc., that careful study be made of the type of farms most suitable, that land speculation be prevented, and that the water charges on different types of land be fixed on the basis of irrigability and productivity.

Land use and production costs on dry-land wheat farms, Columbia Basin, Oregon, A. S. BURRIER and W. W. GORTON. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 373 (1940), pp. 71, figs. 12*).—This study was made to determine the types and sizes of farms best adapted to various conditions; the effect of cropping systems and farm practices on soil erosion, soil depletion, and economical operation; the relation between prevailing practices and needed agricultural adjustments; and costs of producing wheat. Ninety-nine schedules representing individual farms were obtained in Umatilla, Gilliam, and Sherman Counties by personal interviews during the summer of 1936. The region, its agricultural development, the trend and variation of wheat yields, and the soil and erosion conditions are described. The present farm organization—land and crop utilization, tenure, farm investment, receipts, expenditures, income, effect of wheat yields and size of farms on income, and return on investment—the major costs in producing wheat, cost by operations, etc., are analyzed and discussed. The cost of producing wheat hay and of harvesting wheat byproducts is set forth, and methods used in obtaining and analyzing the wheat cost data are described.

Wheat and summer fallow occupied 92 percent of the cropland. Yields of wheat in the region, 1929–36, averaged 19.1 bu. per acre. Only 19 percent of the farms studied were operated by full owners and 58 percent by part owners. The total number of beef cattle, horses, sheep, and dairy cattle were 17, 33, and 72, respectively, in the three counties. Despite the use of a one-crop system of farming, yields in general were being maintained. A field survey of 71 farms showed 58 percent of cropland had lost 25 percent of surface soil by wind or water erosion. The average farm investment varied from \$50,485 for owners to \$6,010 for tenants. During the year ended June 30, 1936, the average farm income was \$3,057, and the average return on investment 6.8 percent. Sales of wheat and A. A. A. payments accounted for 78 percent of the farm receipts. For the 1936 crop year the average yield of wheat was 17.3 bu. per acre and the net cost per bushel 66 ct., of which approximately 36 percent was chargeable to the fallow year and 64 percent to the wheat-growing year. The cost of production, exclusive of interest charges, was 43 ct. per bushel, and the selling price at the local elevator 69 ct. per bushel.

Ranch organization and range land use in Coos and Curry Counties, Oregon, H. R. HOCHMUTH and W. W. GORTON. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 381 (1940), pp. 40, figs. 6*).—This study of the experimental area selected by the Oregon State Land Use Committee for unified action and planning by

Federal and State agencies is based on survey records obtained for the year 1939 for 16 sheep, 5 cattle, 7 dairy, and 12 mixed sheep and cattle ranches lying on cut-over, brush, and open prairies. The ranches varied from 128 to 5,500 acres in size. The climate and topography, vegetation, etc., of the area, and the development of cut-over land for grazing are described. The representativeness of the data is discussed in an analysis made of the size of ranch units, composition of flocks and herds, lamb and calf crops, production and sales, death losses, and the expenses, receipts, labor income, return on investment, etc. An appendix describes the costs of establishing seeded hill pastures in the area.

Of the total acreage, 61 percent was in improved pasture, 37 percent in timber, brush, and wasteland, and 2 percent in crops. The carrying capacity per head averaged 1.7 acres of total land area for sheep and 11.6 acres for cattle. The average investment per head was \$33 on the sheep ranches and \$107 per head of mature cattle on the beef cattle ranches. The labor income averaged \$2.47 for sheep on the sheep ranches and \$5.11 per head of cattle on the cattle ranches. The returns on investment (net income minus \$600 for wages for operator and his family) for the different types of ranches were for sheep 9.7 percent, beef cattle 4.8, dairy 5.4, and mixed 9.4 percent exclusive of rental value of farm home and of products used in the home. The A. A. A. payments for 1939 averaged \$129 per ranch and were used chiefly for pasture improvement. Sheep inventories increased 22 percent during the year, cattle inventories decreased 2 percent, and dairying was decreasing in importance.

"Establishment and maintenance of pasture on properly adapted cut-over and brushlands in Coos and Curry Counties and the utilization of the same with sheep or cattle are relatively profitable, and the industry is expanding."

Planning minimum sized ranches and farms for the Hyde County area in South Dakota. A. G. NELSON. (Coop. U. S. D. A.). (*South Dakota Sta. Bul. 346* (1940), pp. 31+[1], figs. 11).—The physical and economic data pertaining to the county are analyzed with a view to determining the type of agriculture best suited to the area and the minimum size of ranch and farm that will support an average family. "Under ranch conditions (where about 10 percent of the land is in crops) it appears that around 2,500 acres is the minimum which will support a family. Nine hundred and sixty acres is the minimum where extensive farming is practiced (where about 33 percent of the land is in crops) and 640 to 480 acres where intensive farming is practiced (where about 45 percent of the land is in crops)."

Factors for success on starch sweetpotato and general farms in Jones County, Mississippi, 1939. M. GUIN, D. W. PARVIN, and A. J. HUFF (*Mississippi Sta. Bul. 352* (1940), pp. 36, figs. 4).—This study was made to ascertain the services rendered, practices followed, and costs in producing and marketing different farm commodities; the farm organization and operations on typical farms to determine the effect of the Laurel Starch Plant on farm income; the relation of prevailing farm practices to farm income; and possible improvements in production and marketing. It is based on detailed records covering the calendar year 1939 obtained by the survey method. Fifty of the records were for farms on which 2 acres or more of sweetpotatoes were grown for the starch factory and 50 for comparable farms not producing sweetpotatoes. The land use, capital investment, acreage and yields of crops, crop sales, production of livestock and livestock products, farm receipts and expenses, products used on the farm, and farm profits; factors affecting profits—size of business and labor, production, marketing, and capital efficiency; and the cultural practices, labor requirements, and costs and returns in producing cotton and sweet-

potatoes are analyzed. A brief discussion of the long- and short-term credit in the county is also included.

Comparing the sweetpotato farms and the nonsweetpotato farms, the average for the sweetpotato farms was 14.4 acres smaller but with 5 acres more cropped. The capital invested per acre was \$3.27 greater, the acres in corn 2.1 less, acres in cotton 0.7 less, acres in sweetpotatoes 5.7 more, crop sales \$357 greater, value of livestock \$60 greater, sales of livestock and livestock products \$47 and \$63 greater, total receipts \$559 greater, current expenses \$219 greater, labor earnings \$275 larger, and return on investment 6.3 percent greater. For the entire 100 farms labor income increased with number of man-days of productive work, days of productive work per man, number of acres in crops, increases in crop index and capital turn-over, and better balance of farm business. The average net returns per acre in 1939, a year of low crop yields, were \$5.80 for cotton and \$7.92 for sweetpotatoes.

Production and marketing of Maryland sweet potatoes, C. H. SEUFFERLE, R. F. BURDETTE, A. B. HAMILTON, and S. H. DeVault (*Maryland Sta. Bul. 436* (1940), pp. 41-104, figs. 15).—This study was made "to ascertain the present status of the sweetpotato enterprise in Wicomico County, including trends in acreage and production, prices received, and varieties grown; to determine the amounts of labor, power, and materials used per acre; to study the effect of farm management practices on returns; and to study the marketing methods and practices, including grading, packaging, storing, and the spread in price between the producer and the consumer." Data regarding the 1938 crop were obtained by questionnaires and interviews with 102 farmers and 8 local buyers and by following a shipment of sweetpotatoes from a local buyer through the terminal markets and retail stores to the family purchasers. Tables are included and discussed showing for the farms grouped by acres in sweetpotatoes and usually the 20 most and 20 least profitable, the size and value of farms, current cash expenses, number of livestock, acres in different crops, hours of and cost of man labor for different operations, and other items, such as fertilizers, plants, packages, etc. The factors affecting profits, the marketing of sweetpotatoes by growers and local buyers, the distribution and transportation of sweetpotatoes, methods of sale, prices, and costs of marketing are discussed. A number of recommendations to growers are included.

The average acreage in sweetpotatoes in 1939 on the 102 farms was 12.3, being 21.4 percent of the total cropped acreage. An average of 80.3 man hours was required to produce an acre of sweetpotatoes, exclusive of picking. The average cost of labor, including picking, was \$25.53 per acre. Labor constituted about 25 percent of the total costs, fertilizers 25 percent, and packages 20 percent. The total cost of producing and marketing 186 bu. of sweetpotatoes was \$109.39. Growers of the larger acreages tended to have slightly lower costs and received slightly higher prices. On a truckload of sweetpotatoes followed from the packing shed until sold to consumers in New York City, the loss in transit and on the wholesale and jobbing markets was about 5 lb. per bushel and that by retailers about 10 lb.

Need of poultry growth shown by survey, G. R. SIFE (*Miss. Farm Res. [Mississippi Sta.], 4* (1941), No. 5, pp. 1, 2).—Brief findings in a survey of 100 farmers in a community in Lauderdale County as to size of poultry flock; number of eggs produced, used, and sold; average price of eggs; cash income per farm for eggs; investment in poultry buildings and equipment; etc., are included.

The frozen food industry, H. CARLTON (*Tennessee Sta. Bul. 173* (1941), pp. [6] + 175, figs. 38).—The general picture is presented "of the procedures and

methods employed by the frozen-fruit and -vegetable industry from the farm to the consumer, with special emphasis on marketing and distribution." From May 1937 to March 1938, growers, packers of frozen and canned goods, individuals engaged in the storage, transportation, and sale of frozen foods, and retail and institutional consumers were interviewed. The more important information in the previous bulletin (E. S. R., 77, p. 875) is included. Part 1 describes the early history, difficulties, and growth of the frozen-food industry, the present extent of the industry, general sales policies, prices, losses in distribution, etc. Part 2 deals with varieties of fruits and vegetables for freezing, present areas engaged in frozen-food packing, packing seasons, prices paid growers, yields, etc. Part 3 deals with processing operations, and part 4 with cold-storage and transportation rates for frozen fruits and vegetables, freezing of poultry, and freezer-locker plants.

Some economic implications of milk control in Oregon, D. B. DeLoach and W. A. West (*Oregon Sta. Bul. 375 (1940), pp. 19, fig. 1*).—This is a report made at the request of the Oregon Milk Control Board on the economics of producing and marketing fluid milk for human consumption in Oregon. Based on a study of 24 counties, it discusses the purpose and procedures under the Milk Control Act enacted in 1933, the customs and habits of the people affected by milk control, the uniform regulations introduced, the conditions essential to uniform State regulations, the concept of vested rights developed under State regulation, the recommendations of the station, the conditions under which the act can be justified, and the educational program and the economic information necessary for the proper administration of the act.

[Farm income in Mississippi], M. GUIN (*Miss. Farm Res. [Mississippi Sta.], 4 (1941), Nos. 4, pp. 1, 7; 5, p. 8*).—These numbers contain the following: No. 4, Mississippi Cash Income Downward in 1940 for the Fourth Consecutive Year (pp. 1, 7); and No. 5, Income Improves, But Still Too Low for Farm Profit (p. 8).

Graphic summary of farm tenancy in Georgia, J. C. ELSON. (Coop. U. S. D. A.). (*Georgia Sta. Bul. 210 (1941), pp. 39, figs. 34*).—Maps and charts included show number of farms; average acreage in farms—total and by tenure; average value of farms; acreage in specified crops; percentage tenancy in Georgia and other States; farm land operated under lease; tenure of operators; distribution of operators and cropland harvested by tenure and color; changes in tenancy, 1920-30, 1930-35, and 1880-1935; all land in farms and cropland harvested by type of operators; ratios of value of farms, implements, and machinery; value of products used by operator's family; age of operators by tenure; proportions of renters and croppers who are colored; percentages of tenants working for pay not connected with farm, of tenants related to landlords, and of tenants and full owners on present farms less than 2 yr.; etc.

Farmer cooperation in northern Alabama: A physical inventory and appraisal of cooperative endeavor in sixteen counties, L. C. SALTER and E. J. MORGAN (*Alabama Sta. Bul. 249 (1941), pp. 52, figs. 15*).—This study, made in cooperation with the Tennessee Valley Authority, covers the fiscal year 1938 and is based on records of the 18 cooperatives—13 county exchanges, 2 strawberry marketing associations, 2 cotton gins, and a dry-mix fertilizer association—that had been active for at least 1 yr. The agricultural background—soil conditions, number and size of farms, farm and crop acreages, major crops and livestock, population, farm ownership and tenancy, and farmers' cash income and expenditures for feed and fertilizer—is described. The experience of the 18 active associations and 26 that have gone out of business and the status of the cooperatives in 1938—number, location, type, organizational structure, educa-

tional program, financial structure, and statistical and business analysis for 1938—are discussed. The favorable and unfavorable factors, possible future developments, and cooperative education and business advisory service are also discussed.

Of the 44 associations, all those organized prior to 1927 were found to be inactive. The active associations had 9,299 members, of whom 8,123 were patrons and 6,800 nonmember patrons. The assets in 1938 of 16 associations amounted to \$180,800, the liabilities \$65,500. Efficient management, a "near-cash" or limited credit policy, democratic control through a one-vote-per-member policy, and lack of overinvestment in fixed assets were factors favorable to success. Failure of membership requirements to include capital investment, operation on too small a margin, lack of adequate educational programs, unsatisfactory accounting methods, extension of too much credit, too small patronage, limited effort in interesting nonmember patrons in becoming members, competition between the associations, and lack of adequate wholesale facilities were some of the factors that had been unfavorable or caused failure of associations.

Some economic considerations of marketing Oregon fruits and vegetables through cooperative canning associations, D. B. DeLoach and C. W. Peters. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 377 (1940), pp. 77, figs. 5*).—This report is based on a study of data obtained chiefly from records and officials of nine fruit and vegetable associations in Oregon, Washington, and Idaho that obtain all or a substantial supply of their products for canning from Oregon growers. Consideration is also given to the 52 commercial concerns engaged in packing, brining, cold-packing, and fast-freezing fruits and vegetables, and their influence on the cooperative associations. The supply and disposition of fruits and vegetables grown in the State, the legal bases of cooperative marketing associations, the financial structure, methods of financing, returns to grower and the factors affecting such returns, the investment in buildings and equipment, the minimum investment required of growers, the methods of financing new associations, and the loan policy of the Spokane Bank for Cooperatives are analyzed and discussed.

The commercial canneries normally pack about 50 percent of the vegetables canned, about 73 percent of all fruits and berries canned, and 61 percent of those marketed cold-packed. Some of the findings as to the cooperative associations were as follows:

In general, patrons living more than 25 miles from the cannery cannot be served satisfactorily. Slight increases in membership occurred in six of the associations from 1936 to 1938, and the number of patrons increased in all but one association. Three of the associations had net worth in excess of net fixed assets, and all but one had net worth in excess of fixed debts and were accumulating capital reserves. The estimated average investment per member for 1938 ranged from \$184.52 to \$1,111.88, the per ton of produce handled from \$7.65 to \$73.64, and the per case of product from 45 ct. to \$1.48. Preferred stock has been unsatisfactory as a means of obtaining investment funds. Managerial policies have been relatively stable in each association. Pay-out prices on like products in the same season have varied between associations due to investment, labor cost, shrinkage of product, managerial efficiency, etc. All of the associations purchase supplies for growers and most of them render other services. The chief sources of credit were loans from members, the Spokane Bank for Cooperatives, and bonded warehouses. It appears that the best credit policy is for members to finance permanent investment and to obtain working capital by operating and commodity loans.

Farmers' mutual fire insurance companies in North Carolina, M. C. Leager. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul. 329 (1941), pp. 19, figs. 4*).—

This is the first of two studies and deals with the selection of risks, rates, receipts, losses, reserves, costs, etc. It is based on the annual financial reports and information obtained from the secretaries of 27 companies. In 1938, the averages per \$100 of insurance were assessments 35.5 ct., losses 17.2 ct., ranging from 0 to 49 ct., ratio of losses to total disbursements (1937) 71.5 percent, and reserves 99.6 ct. Expenses declined as size of company increased up to \$1,500,000 of insurance but losses increased, except for the largest companies. Generally losses were least for companies operating in only one county, but expenses were greater.

The State fiscal capacity of Maryland and other selected States, V. J. WYCKOFF and W. P. WALKER (*Maryland Sta. Bul.* 438 (1940), pp. 165-204).—An analysis is made of (1) the degree to which budget estimates of State tax revenues, 1928-39, inclusive, were fulfilled by actual receipts, (2) the fiscal capacity, used and unused, of taxpayers of the State, and (3) the specific and substantial State taxes in use in Maryland and other States.

State tax revenues of Maryland in dollars increased 50 percent from 1928 to 1939. The increase was less than the average of the other States deemed comparable with which comparisons were made. The budget estimates of tax revenues and actual receipts were reasonably close in most years. Total tax revenues increased 55 percent in Maryland from 1929 to 1939 as compared with 70 percent in the median for the other States, and could be increased from 5 to 10 percent more without throwing them out of line with the other States of comparable fiscal capacity. It is recommended that no change in or replacement for the State's share of the general property tax be made until the State debt is retired, and that then the part of the State property tax be replaced by other sources and the general property tax be left for local government support. It is estimated that Maryland could receive \$2,200,000 from excise taxes on tobacco products, but it is recommended that such taxes be not imposed until needed. General sales tax would produce from 5 to 18 million dollars, depending on the rate. Such a tax would assure large and substantial receipts but would give rise to the question of fiscal justice between high- and low-income groups. Maryland receives a larger percentage of its total tax revenues from alcoholic beverages than other States but considerably less than States operating retail liquor stores. The State is receiving more than the average returns from the gasoline tax but less than the average from motor vehicle taxes.

The State is assured of \$7,500,000 from its 1939-40 individual and corporation income taxes, but the use of progressive rates or rates based on sources of income would assist in bringing about more equitable taxation of important sources of income. Inheritance and estate taxes in the State should be changed from a flat to progressive rates. The amount now received is about \$2,000,000 per year, but an increase of 20 percent would be a fair fiscal objective.

RURAL SOCIOLOGY

The evolution of the American community, C. C. ZIMMERMAN (*Amer. Jour. Sociol.*, 46 (1941), No. 6, pp. 809-817).—In the beginning the North American community was realistically integrated because it represented the transplanting of the medieval semifeudal village on our eastern coast. In America, age of settlement has been a constant factor promoting community realism. Mobility, low and differential fertility, urbanism, trade and commerce, and centralization of government and economic life have promoted community nominalism. On the whole, however, the evolution of the American community, after its first

settlement, has been toward realistic integration. This process will probably move more rapidly in the twentieth than in the nineteenth century because the community-forming forces are gaining the upper hand over those which promote disintegration.

Rural social studies (*Tennessee Sta. Rpt. 1939*, pp. 47-48).—Findings by C. E. Allred on the extent of rural relief in relation to tenure and soil class and the progress of farm children in elementary schools are briefly noted.

State farm population decreases 10 percent, R. W. ROSKELLEY (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 2, p. 14).—The station reports that there were an estimated 251,838 persons on Colorado farms and ranches in 1940 compared to 281,038 in 1930—a decrease of 10.4 percent. These figures are based upon a preliminary release of the U. S. Bureau of the Census. There is evidence that a sizable proportion of those who moved from the farms to the villages have been handicapped economically and are thus prevented from contributing their share to the support of such institutions.

Characteristics of a group of partnership farms, J. P. GREENLAW and H. L. RICHARDSON (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 5, pp. 14-17).—The authors compare 38 satisfactory with 17 moderately satisfactory partnerships in farming in Cass and Traill Counties. The satisfied partner was of native birth, about 43 yr. of age, and related to his partner either by blood or marriage. He had lived on the same farm about 21 yr. and in the same community for 27 yr. In comparison, the only moderately satisfied partner is younger, has less schooling, and has lived on the same farm and in the same community a shorter period of time. He is more often a tenant than an owner.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Bibliography of research studies in education, 1938-1939, R. A. GRAY (*Fed. Security Agency, U. S. Off. Ed. Bul. 5* (1940), pp. XIV+411).—This bibliography, covering the school year 1938-39, includes 3,570 theses and studies in 174 institutions, of which 56 are on agricultural education, 69 on home economics, and 80 on rural education, including consolidation of schools and transportation of pupils.

Agriculture in the Southwest, E. J. KYLE and E. R. ALEXANDER (*New York: Charles Scribner's Sons* [1940], pp. XVIII+474, figs. 186).—This text is designed to follow that on *Fundamentals of Farming and Farm Life* (E. S. R., 63, p. 889), adopted by Texas for use in the sixth and seventh grades, and places special emphasis on the economic factors affecting farming. It consists of contributions by members of the staff of the Agricultural and Mechanical College of Texas on the agricultural situation, planning the farm business, marketing farm commodities, soil conservation, cotton, corn, the sorghums, small grains, forage crops and pastures, vegetable growing, fruit growing, beef cattle production in the Southwest, dairying, sheep and Angora goats, hog production, poultry, horses and mules, farm power and mechanical equipment, and wildlife as a farm byproduct.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition of the Tennessee Station] (*Tennessee Sta. Rpt. 1939*, pp. 50-52).—This progress report (E. S. R., 83, p. 564) includes data by F. L. MacLeod on the vitamin A value of Nancy Hall sweetpotatoes at harvest and after 4 mo. and 8 mo. of storage, and a summary of a study of the dietary habits of home economics students before and after nutrition study.

[Studies in foods and nutrition of the Washington Station] (*Washington Sta. Bul.* 394 (1940), pp. 51-53).—Included in this progress report (E. S. R., 83, p. 288) are summaries of studies, some of which represent an extension of earlier work, by E. N. Todhunter and R. C. Robbins on the vitamin A and C content of Winter Nellis pears and the vitamin C content of frozen-pack red raspberries of the Tahoma and Washington varieties and of frozen-pack boysenberries, on factors affecting the vitamin C content of frozen-pack peas, and on the blood plasma ascorbic acid of men and women students; by M. M. Boggs on factors influencing the skin texture of peas preserved by the frozen-pack process; by Boggs and H. P. Singleton on the effects of methods and rates of irrigation on the cooking quality of Netted Gem potatoes; and by A. M. Neubert, M. K. Veldhuis, and C. W. Eddy on milk-fruit juice drinks for children.

Green vegetables superior to those bleached, in content of calcium and iron and vitamins A and C, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 5, p. 8).—Data, assembled from various sources including hitherto unpublished findings of O. A. Leonard, are given, showing a higher content of calcium, iron, vitamin A, and vitamin C in the outer green leaves than in the inner bleached leaves of cabbage and lettuce and in green than in bleached asparagus, and a higher content of vitamin A in green than in bleached celery.

The calcium and phosphorus content of certain vegetables grown under known conditions of fertilization, E. ELMENDORF and H. B. PIERCE (*Jour. Nutr.*, 20 (1940), No. 3, pp. 243-253).—Data on moisture, ash, Ca, P, and Ca : P ratios are reported for 15 samples each of beets (Detroit Dark Red), cabbage (Glory of Enkhuizen), corn (Golden Cross Bantam), and beans (Stringless Refugee). These samples were harvested from 15 plats, all in a given region and representing the same soil type but variously fertilized with respect to N, P, and K. One of these plats, serving as a control, had no fertilizer treatment and had had none for 8 yr. Summaries indicating the effect of fertilizer treatments, as compared with the nonfertilized controls, on ash, Ca, and P content are presented and discussed. These comparisons seem to indicate that within the limits of the particular study corn and beans grown on fertilized plats contained less Ca than those grown on the unfertilized plat, while all vegetables examined contained more P when given fertilizer treatment. It is suggested that Ca may be replaced by another base, possibly K, supplied by the fertilizer. The Ca and P contents of the vegetables varied widely and frequently in opposite directions so that Ca : P ratios fluctuated between rather wide limits. "The importance of chemical analyses of food in metabolism studies is stressed because foodstuffs grown on different soil types under varying conditions of fertilization, culture, and climatic conditions may exhibit marked differences in composition."

Pericarp toughness as a factor in freezing adaptability of sweet corn. (Coop. U. S. D. A. and Wash. Expt. Sta.). (*Western Washington Sta. Rpt.* 1940, p. 36).—This preliminary report deals with a phase of a cooperative investigation by C. D. Schwartz, C. H. Rundle, H. T. Campbell, and M. Boggs of factors affecting quality in frozen cut sweet corn.

Several discoveries result from station's investigation of cooking quality of potatoes, W. E. PYKE and G. JOHNSON (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 2, pp. 15-19).—This is essentially a progress report on a continuing investigation of factors affecting the cooking quality of potatoes (E. S. R., 84, p. 414).

Deep-frying tests of potato chips have shown that intensity of color, percentage of fat absorption, and percentage of chip yield are inversely proportional to the specific gravity of the potatoes used, but that leaching low specific gravity

potatoes, such as Bliss Triumph, 1 hr. before frying improves the quality characteristics. No significant relationship was found to exist between reducing sugars and the color solids extracted from the chips or the cost per pound of the chips. More varieties of potatoes gave good qualities on baking than when peeled and boiled. Late planting with greater immaturity on harvesting resulted in a greater tendency of the potato to fracture and slough on boiling and to develop higher chip color on frying. Maturity differences due to variation in planting dates in the State can be overcome by proper attention to storage conditions.

Nitrogen fertilization alone yielded potatoes of poor quality, phosphorus fertilization potatoes of medium large size and some netting of the skin, and potash fertilization a small-sized product with rather pronounced netting. Nitrogen with potash and phosphorus with potash were inferior to phosphorus and nitrogen which gave the best results in a 6-30-0 ratio. Complete fertilization gave high-quality potatoes except for a rather high sloughing. Storage at 32°-42° F. and a high relative humidity, about 85 percent, gave potatoes of fine appearance, firm, and crisp, but tempering for about 2 weeks at a temperature of from 65° to 75° was necessary for good quality in cooking.

It is emphasized that potatoes are grown for both specialized uses and for general purposes, that no potato variety is satisfactory for all purposes, but that for general all around use potatoes with relatively high specific gravity will most nearly meet all requirements. Sorting or grading of potatoes by means of specific gravity is suggested as a practical method of throwing varieties, or potatoes within varieties, into quality grades.

Factors for color in the production of potato chips, F. E. DENNY and N. C. THORNTON (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 291-303, pl. 1).—Tubers of 11 varieties of potatoes of the 1939 harvest were placed in cold storage on December 1, 1939, at temperatures of 5°, 10°, and 15° C. After 54, 57, and 62 days, respectively, samples from each of these 3 lots were transferred to temperatures of 15°, 22°, and 27°; at intervals of 3, 7, and 16 days samples from the 9 lots were again placed in cold storage at 5°, where they were held for periods of 10 days, 3 weeks, and 6 weeks. At every stage samples were removed, the sugar contents of the juices were determined, and potato chips were prepared. A good correlation was found between the amount of reducing sugar in the juice and the extent of browning of the potato chips prepared from the tubers which furnished the juice. No such correlation existed, however, between sucrose content and color of chips. These conclusions were confirmed by results with pieces of filter paper soaked in various sugar solutions and starch suspensions and then cooked in fat at the temperatures found critical for the browning of the potato chips from the various samples. Wide varietal differences were observed as to reducing sugar content of the juice, and hence, chip color, both at the start of the tests and after the various periods of storage. Tubers of the Russet Rural variety were consistently low in reducing sugar (but not in sucrose) and yielded chips very light in color. Chippewa, Carmen No. 3, Irish Cobbler, and Katahdin varieties were rather low in reducing sugar under most conditions and produced chips of good color, while Bliss Triumph and Green Mountain were consistently high in reducing sugar and gave chips that were too brown. Other varieties were intermediate as to sugar content and color production. Continuous storage at low temperatures inhibited sprouting but induced high sugar contents and unsatisfactory color. The various effects observed upon transferring from one temperature to another are discussed.

Soybeans in the diet, J. K. HALE (*Tennessee Sta. Cir.* 74 (1941), pp. 4).—Practical directions based upon experience in the introduction of soybeans into

the diet of families of the Crossville project noted on page 575 are given for the preparation of soybean meal products, with recipes for corn bread, biscuits, rolls, and muffins; and of whole soybean products, including boiled and salted soybeans, with recipes for baked soybeans and soybean meat loaf.

Studies of western tomatoes. G. S. BOHRET (*Food Res.*, 5 (1940), No. 5, pp. 469-486, fig. 1).—Well-matured tomatoes, selected on the basis of red color only or as solid pack canning stock canned by commercial methods, were collected during the canning seasons of 1935-37, inclusive. The 141 samples, representing 12 varieties (Early Santa Clara, Stone, Earliana, Baltimore, Landreth, Rutgers, No. 138-6, No. 138-8, Cal 65, Prichard, Jack o' Hearts, and San Marzano) were collected from various parts of California, Colorado, and Utah, and were analyzed by methods noted for total, insoluble, and soluble solids, alcohol-insoluble solids in filtrate, pulp, seeds, pigment, crude fiber, total acidity, pH, ash, sugar, protein, pectin, protopectin, potassium, calcium, magnesium, iron, manganese, copper, phosphorus, sulfur, and chlorine. Average, maximum, and minimum values for the San Marzano variety (a pear-shaped type) compared with similar values summarized for all the other varieties and all localities indicate that this variety is similar to the others in most constituents, but is somewhat less acid and somewhat higher in pulp, insoluble solids, and calcium. Separate analyses of flesh and free locule contents of tomatoes, collected from four localities and representing two lots of the Stone variety, one of the Early Santa Clara, and one of San Marzano, show that in general ash in the free locule contents is higher than in the flesh, due apparently to the presence of seeds in which the mineral constituents are concentrated, and that the reverse is true for chlorine. Correlation coefficients comprising practically all combinations of the analytical factors are reported, and the positive and the negative correlations between chemical constituents and physical characteristics are summarized and discussed.

Factors the baker should consider in preparing the yellow sponge cake. W. E. PYKE (Colo. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 1, pp. 92-106, figs. 8).—Continuing altitude studies (E. S. R., 83, p. 268), methods of mixing were developed which would permit the true sponge cake to be prepared by means of large commercial mixing equipment. These methods are described, and factors of concern to the commercial baker are discussed.

"The leavening of true sponge cakes (angel food and yellow sponge) should be controlled by specific gravity determinations upon the batter. Time of beating as a factor to control this ingredient is not dependable. Formulas for the preparation of yellow sponge cakes at various altitudes have been given. Interpolation between the intervals of 2,500 ft. is permissible. The formulas for yolk sponge cakes adjusted to various altitude conditions yield cakes which compare to butter cakes in tenderness. Their quality is high. They require a longer baking period than the whole-egg sponge."

Microbiological content of paper-board used in the packaging of foods. J. R. SANBORN. (N. Y. State Expt. Sta.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 3, pp. 247-255, figs. 2).—In investigations of the sanitary quality of paper and paperboard products representing several hundred shipments of container board, paper wrappers, and bottle cap stock, only a very few instances were found in which the bacterial counts were in excess of 500 per gram of the disintegrated paper or paper product. These materials, disintegrated for analysis by using a standard malted milk mixer, were plated with the use of several different mediums, and incubated at 37° C. for 48 hr. Essentially duplicate counts were obtained on over 600 samples in two different laboratories. The bacteria found were common saprophytic, aerobic, spore-forming

bacilli; micrococci; sarcinae; actinomyces, and non-spore-forming rods; and the molds belonged to the genera *Penicillium*, *Alternaria*, *Fusarium*, *Aspergillus*, *Cladosporium*, and *Trichoderma*.

Healthy eating, V. H. MOTTREAM (London and Toronto: Cassell & Co., [1940, 2 ed.], pp. VII+126, figs. 2).—This book, written in popular style, presents useful information on the author's concept of dietetics. The British diet today; what food does, or why we have to eat; building one's own diet; individual diets for the normal; and individual diets for the slightly abnormal constitute the subjects discussed.

The study of intermediary metabolism of animals with the aid of isotopes, R. SCHOENHEIMER and D. RITTENBERG (*Physiol. Rev.*, 20 (1940), No. 2, pp. 218-248).—In this extensive review, which is concerned with the metabolism of organic compounds, only those radioactive isotopes which have been used as markers in organic molecules are considered. Radioactive isotopes which have been employed in the study of the metabolism of ions are not discussed. The work represented in the 131 papers noted in the bibliography is discussed under the following headings: General properties of isotopes, general methods for following metabolic reactions, preparation of isotopic compounds, principles of analysis of isotopes in organic compounds, the metabolism of food and body constituents, carbohydrate metabolism, protein metabolism, the metabolism of creatine and creatinine, phosphorylation in muscle, and isotopic compounds as indicators for chemical reactions of body constituents.

The comparative rate of absorption of some natural fats, H. J. DEUEL, JR., L. HALLMAN, and A. LEONARD (*Jour. Nutr.*, 20 (1940), No. 3, pp. 215-226).—Several different fats were fed by stomach tube in 1-cc. doses of the melted fat to rats of similar size (240-310 gm.) previously fasted for 48 hr. After periods of 3, 4½, or 6 hr. the rats were anesthetized with amytal, the intact gastrointestinal tract was removed, and the fats remaining in the gut were removed by flushing out the entire contents with warm water, followed by petroleum ether, or with diethyl ether. The average recovery for various fats in eight of the nine series of tests exceeded 90 percent. No consistent differences were observed in the rate of absorption of hydrogenated cottonseed oil, "wintered" cottonseed oil from which the tristearin had been largely removed, butterfat, or coconut oil. In most cases the rate of absorption lay between 40 and 50 mg. per 100 cm.² of body surface per hour. The absorption of rapeseed oil was somewhat slower, the maximum differences being noted in the 6-hr. tests where values of 30.0 and 26.2 mg. were obtained with male and female rats, respectively; the higher values for absorption over the 3-hr. period were considered as resulting from the normal absorption of the palmitic, stearic, and oleic acid components of this oil. After disappearance of these the rates fell markedly, apparently because of inability to utilize the higher chain triglycerides.

In other tests with hydrogenated cottonseed oil in which rats of widely varying weights were used, the amount absorbed was considerably greater in the large rats, a dose of 1,100 mg. being absorbed in 3 hr. to the extent of 43.2 and 28.1 percent by large and small male rats, respectively. When doses of the fat administered to large and small rats were uniform on the surface area basis (300 mg. per 100 cm.²), the percentages absorbed were more uniform, amounting to 43.2 and 51.0 percent in large and small rats, respectively; when a correction was applied to allow for differences in metabolic activity, the respective values became 38.1 and 43.7 mg. per 100 cm.² per hour. In rats of similar size the quantity of fat absorbed increased somewhat when increased amounts were fed.

The rate of absorption of synthetic triglycerides in the rat, H. J. DEUEL, JR., and L. HALLMAN (*Jour. Nutr.*, 20 (1940), No. 3, pp. 227-232).—The extent of digestion and absorption of the synthetic triglycerides from triacetin to tricaprylin, as well as triisovalerin and trilaurin, were studied in rats over a 3-hr. period when they were fed doses equivalent to 300 mg. per 100 cm.² of surface area. The absorption was determined by the method noted in the study above, diethyl ether alone being employed for extraction of the gastrointestinal tract.

The tabulated results indicate that triacetin and tributyrin, having rates of 63 and 65 mg. per 100 cm.² per hour, were most rapidly absorbed of any of the synthetic fats studied, these rates also being greater than those obtained for the natural fats used in the above study. Tricaproin and tricaprylin disappeared somewhat more slowly from the alimentary tract of the rat, while trilaurin was only slowly removed (22 mg. per 100 cm.² per hour), presumably because of its high melting point which caused its solidification in the stomach of the rat. No successful experiments were completed with tricaprin because of a violent diarrhea which ensued in these tests. Neutral fats composed of odd-chain fatty acids were absorbed at a rate of 50 percent or less of that characteristic of the corresponding even-chain fats. Thus, the rates of 31, 33, and 28 mg. per 100 cm.² per hour, obtained for tripropionin, trivalerin, and triheptylin, respectively, were less than those for any of the natural or synthetic fats studied for 3-hr. periods. Triisovalerin was absorbed at a rate which compared with that of the even-chain fats.

The influence of the type of carbohydrate ingested upon citric acid production, C. E. MEYER and A. H. SMITH (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 739-747).—Evidence is presented to indicate that when carbohydrate comprises 65 percent of a ration, expressed as glucose, the nature of the carbohydrate influences the amount of urinary citric acid excreted by rats. With glucose, fructose, or galactose essentially the same amounts of citric acid were excreted, these being more than twice the amounts excreted with dextrin or starch.

The relation of phytin to the calcifying action of citrates, H. G. DAY (*Jour. Nutr.*, 20 (1940), No. 2, pp. 157-168).—To test the calcifying effect of citrates on bones, young rats were fed, for 20 or 21 days, a citric acid-sodium citrate mixture at 2 or 4 percent levels in a series of eight rachitogenic diets composed of (1) cereals or (2) purified components, or (3) purified components plus phytin, and further adjusted to contain different amounts of calcium and phosphorus. The degree of mineralization evidenced by the weight and the percentage of ash in the fat-free bone in these experimental groups as compared with controls not receiving the citrate mixture was used as the criterion for judging the effect of the citrates. Results, tabulated and discussed in some detail, indicated that calcification in the bones was promoted by citrates when added to a cereal ration high in calcium and low in phosphorus. With a purified ration of high-calcium and low-phosphorus content, the added citrate mixture did not promote calcification. In neither the cereal ration nor the purified one did the citrates have appreciable calcifying effect when calcium and phosphorus were moderate or when calcium was low and phosphorus high. Citrates added to a purified ration containing phytin caused a definite increase in calcification when the Ca:P ratio was high, but had no effect with a moderate Ca:P ratio. The beneficial effects of citrates in the rachitogenic diets occurred, therefore, only when there was a high Ca:P ratio and appreciable quantities of phytin or, as is suggested, other phosphorus-containing complexes of low biological activity. On the basis of the present results

and other findings discussed, it is emphasized that the exclusive use of cereal rations in the study of rickets or other problems of calcium and phosphorus utilization may lead to difficulties

Pectic enzymes.—V, The fate of pectins in the animal body, Z. I. KERTESZ. (N. Y. State Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 3, pp. 289-296, fig. 1).—In the interest of determining the working mechanism of the apple diet as used to combat diarrhea, studies were continued (E. S. R., 83, p. 206) to obtain information on the fate of pectins in the animal body. A powdered citrus pectin was used in the present tests, this pectin, as chemical tests showed, being composed almost exclusively of polygalacturonic acid in which most of the carboxyl groups were esterified.

"Tests made with human subjects and dogs indicated that saliva and gastric juice do not contain enzymes acting upon pectin. Pectin passed through the stomach and part of the small intestine of a dog could be recovered without loss. Trypsin, pepsin, and rennet had no effect on pectin in vitro, but pectin incubated with feces was rapidly decomposed. It appears probable that pectin taken orally is not attacked until it reaches the large intestine, where it is completely hydrolyzed by bacterial enzymes."

The appearance of radioactive iron as hemoglobin in the red cell: The significance of "easily split" iron, L. L. MILLER and P. F. HAHN (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 585-590).—Blood samples were drawn in duplicate from anemic dogs that had received oral doses of radioactive iron. Activity determinations were carried out on crystalline hemoglobin obtained from the one sample and on washed red cells from the other sample. These determinations showed that the radioactive iron in the red blood cells, following its feeding, was nearly quantitatively present in the hemoglobin crystals obtained from the cells. The radioactive element in the fraction of the total red cell radioiron easily split off by 0.1 N HCl appeared in quantities ranging from 3 to 23 percent of the red cell radioiron. Although there was a suggestive increase in the easily split fraction following massive blood destruction due to administration of acetylphenylhydrazine, still the radioiron was present in very young red cells circulating 24 hr. after feeding the radioelement, as well as weeks later. These results are considered, therefore, as not supporting the hypothesis that the easily split fraction of red cell iron is associated with any particular stage of the aging of the red cell. It is suggested that the easily split fraction of red blood cell iron is an artifact.

Histological studies of the tissues of rats fed a diet extremely low in phosphorus, R. H. FOLLIS, JR., H. G. DAY, and E. V. MCCOLLUM (*Jour. Nutr.*, 20 (1940), No. 2, pp. 181-195, pl. 1).—In a detailed study of the changes in gross appearance and in microscopic structure of the tissues, rats fed a low-phosphorus diet (E. S. R., 84, p. 126) containing 0.17 percent of phosphorus and 0.4 percent of calcium were compared with controls on the same diet supplemented with phosphorus to a level of 0.27 percent. A total of 73 rats about equally distributed as to sex and sacrificed for autopsy at different intervals was used in two series of experiments, the feeding being ad libitum in the first series while in the second the food intake of the control animals was restricted to essentially that of the phosphorus-deficient group. By this paired feeding technic the effect of partial inanition could be judged.

The test animals were small, their skeletons became greatly rarefied so that the bones were soft and easily cut, there was a great decrease in adipose tissue, there were marked changes in the form and great decrease in the size of the thorax, and with the softening and bowing of the ribs there was marked collapse of the lungs. The control animals in the first series were much larger than those

in the test group and showed none of the abnormal bone or thoracic and lung changes. Controls in the second series, however, differed but little in size and general appearance from the test animals; the thorax also was deformed and decreased in size, although not so reduced as in the deficient animals. The microscopic findings indicated that marked skeletal rarefaction, with accompanying rickets, developed in the phosphorus-deficient animals but not in the controls of either series. In the deficient animals other changes were observed, these being most marked in the thymus and reproductive organs. These were considered to be due to inanition, since the same changes were apparent in the controls on restricted food intake, although not in the controls fed ad libitum. The results emphasize the importance of paired feeding in experiments of this kind.

The absorption of fluorides by enamel, dentin, bone, and hydroxyapatite as shown by the radioactive isotope, J. E. VOLKER, H. C. HODGE, H. J. WILSON, and S. N. VAN VOORHIS (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 543-548, fig. 1).—Details are reported of experiments to determine the amount of fluorine adsorbed per gram of enamel, dentin, bone, and hydroxyapatite from radioactive fluorine solutions at five different dilutions. The data presented show that these substances all adsorbed fluorine according to the Freundlich adsorption isotherm. The coefficients characteristic of the adsorbed substance (n) and of the adsorbent (k) were calculated for each substance.

Cow's milk treated by base exchange for infant feeding: Metabolism of calcium, phosphorus, and nitrogen, J. H. HESS, H. G. PONCHER, H. W. WADE, and J. C. RICHWASSER (*Amer. Jour. Diseases Children*, 60 (1940), No. 3, pp. 535-547, figs. 3).—In support of an earlier study by Hess et al. (*E. S. R.*, 73, p. 561), evidence is here detailed to show that unboiled milk treated by the base-exchange process serves to maintain positive calcium, phosphorus, and nitrogen balances in normal infants. This evidence was obtained in metabolism trials with six normal boys under 1 yr. of age, observed in two experimental periods of 12 days each in which they received boiled whole milk and unboiled base exchange-treated milk, respectively. All formulas, supplemented with orange juice and vitamin D, were calculated on the basis of minimum requirements, namely, $1\frac{1}{2}$ oz. (45 cc.) of milk per pound of body weight.

Essentially the same absolute amounts of Ca, P, and N were absorbed and retained from the boiled whole milk as from the unboiled base exchange-treated milk. The average absorption values per kilogram of body weight per 24 hours for these two milks amounted to 27.7 and 25.8 mg. for Ca, 60.9 and 57.5 mg. for P, and 418.8 and 420.1 mg. for N; the corresponding retention values amounted to 25.5 and 23.9 mg., 15.9 and 15.2 mg., and 83.6 and 80.4 mg. These absolute values calculated as percentages of the amount ingested showed on the basis of the statistical odds that the percentage of P absorbed was definitely higher from the unboiled base exchange-treated milk, that the percentages of Ca absorbed and retained from the two milks were similar, and that there was no difference in the availability of the N from these two milks. It appears, therefore, that the reduction of Ca and P content of milk by the process of base exchange does not impair its nutritive value.

Effect of varied banana intake on nitrogen and mineral balances of normal children, H. A. HUNSCHER, F. C. HUMMEL, I. G. MACY, ET AL. (*Amer. Jour. Diseases Children*, 60 (1940), No. 3, pp. 509-517).—The effects of incorporating 100 or 200 gm. of banana in the daily diet were studied in eight average healthy children aged 5-8 yr. observed under controlled conditions. Although there were minor variations in individual responses, all of the children grew well and showed consistent changes in metabolic response to the increased banana intake. For the eight children the gain in weight per kilogram of body weight averaged 0.64 and 0.66 gm. per day in the 275-day preexperimental and

285-day experimental periods, respectively. In no case was the caloric intake increased by more than 4 calories per kilogram of body weight per day.

In each child an additional 100 gm. of banana produced (per kilogram of body weight) an increased retention or an increased percentage of intake retained of each of the elements studied. For N the rate of storage was increased from 17 to 22 mg. per kilogram of body weight per day (or from 3 to 4 percent of the intake); similarly, for K the increase was from 8 to 10 mg. (no change in percent); for Ca from 4 to 5 mg. (from 11 to 14 percent); for Mg no change calculated in milligrams per kilogram, but an increase from 7 to 10 percent of intake; for Na an increase from 5 to 6 mg. (from 5 to 6 percent of intake); for P from 5 to 6 mg. (from 9 to 12 percent); for Cl from 11 to 14 mg. (from 7 to 8 percent); and for S retention in milligrams unchanged, but increased from 1 to 4 percent of the total intake. While the retentions of mineral cations and anions both increased during the experimental period, indicating a speeded rate of synthesis of both hard and soft tissues, the storage of excess base per kilogram per day was slightly reduced, implying a greater stimulus to construction of soft tissue.

A revaluation of the method described by Goodhart and Sinclair for the determination of blood cocarboxylase values, R. GOODHART (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 77-84).—The Goodhart and Sinclair method for determining blood cocarboxylase (E. S. R., 83, p. 420), which was developed in England, has been found to require certain modifications when used with yeasts available in this country. These consist essentially in using 50 γ of vitamin B₁ in place of 10 γ , in making the determinations on blood cells which have been washed three times with equal volumes of 0.8 percent NaCl and diluted with phosphate buffer (pH 6.2) to their concentration in whole blood in place of using whole blood, and in omitting the calcium chloride.

Values obtained by the modified method for 28 clinically normal boys ranging from 5 to 15 yr. in age varied from 4.5 γ to 10 γ per 100 cc. of blood, with a mean of $7.0\gamma \pm 1.53\gamma$ per 100 cc.

Nutritional diseases in the United States: Clinical lecture at New York session, W. H. SEBRELL (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 10, pp. 851-854).—Nutritional diseases considered to be of the most importance in the United States are listed as "anemia, due to iron or cobalt deficiency; nutritional edema, due to protein deficiency; hyperkeratosis and night blindness, due to vitamin A deficiency; beriberi and peripheral neuritis, due to thiamin (vitamin B₁) deficiency, frequently secondary to such conditions as alcoholism, pregnancy, and diabetes; lip lesions, seborrhea, and keratitis, due to riboflavin deficiency; pellagra or encephalopathy, due to nicotinic acid deficiency; swollen bleeding gums, skin and subperiosteal hemorrhages, due to ascorbic acid deficiency; rickets and osteomalacia, due to vitamin D deficiency; hemorrhagic disease of the newborn, due to vitamin K (phthiocol) deficiency; tetany, due to hypocalcemia; and probably many other at present less well identified conditions with a nutritional background." Figures are quoted from census reports from 1934 to 1938 to show that, except for pellagra, the total number of deaths from all these conditions is relatively insignificant and that, except for beriberi which has shown an increase, there has been a decrease in reported deaths between 1934 and 1938. It is noted, however, that the number of deaths afford little information with regard to the amount of sickness and disability, and that indirect information of various types indicates that nutritional diseases cause an enormous toll in illness and disability in this country.

Particular emphasis is given to the signs and symptoms of human riboflavin deficiency which have been brought to light in the 2 yr. since the deficiency was recognized, with the conclusion that unrecognized riboflavin deficiency is

perhaps very widespread in this country and is another indication of the probable extent of nutritional diseases.

Determination of carotene in fresh and frozen vegetables by an improved method.—II, Carotene content of asparagus and green lima beans, W. I. ZIMMERMAN, D. K. TRESSLER, and L. A. MAYNARD. (N. Y. State Expt. Sta. coop. Cornell Univ.). (*Food Res.*, 6 (1941), No. 1, pp. 57-68).—In continuance of earlier work (E. S. R., 84, p. 847) the method of Hegsted et al. (E. S. R., 82, p. 439) was used. It was modified to include the use of diacetone for extraction of total pigments from fresh and frozen vegetable tissues, with separation of carotene from the diacetone-water extract by petroleum ether, and subsequent purification of the petroleum ether-carotene solution by extraction with a mixture consisting of 100 parts by volume of diacetone and 6 parts of water. Chromatographic separation of the pigments in the petroleum ether solution using a specially prepared adsorption column of magnesium oxide and Supercel, followed by spectrophotometric analysis of the eluted pigment bands, showed that the diacetone procedure determines relatively pure forms of the provitamins A. Vitamin A activity of asparagus, as determined by the use of the photoelectric spectrophotometer, was shown to be due to β -carotene, while the vitamin A activity of green lima beans was due to about one-third α - and two-thirds β -carotene.

Asparagus, green lima beans, spinach, and broccoli were analyzed for carotene content at various stages of commercial processing for freezing and storage, the results obtained indicating no appreciable loss of carotene in the process. The carotene content of Henderson Bush lima beans, as determined by bio-assay and by chemical analysis, was found not to change during 5 mo. of storage at 0° or -40° F. As determined by bio-assay, the carotene content of asparagus stored at 0° and -40° for 7 mo. amounted to about 60 percent of the value determined by chemical analysis.

The effect of unsaturated fatty acids upon the utilization of carotene (*Alabama Sta. Rpt. 1939*, p. 28).—A brief summary is given of evidence obtained by W. C. Sherman leading to the conclusion that linoleic acid interferes with the metabolism of carotene in young rats, and that certain oils, such as soybean oil, contain factors which protect against this interference.

Measurement of vitamin A status of young adults by the dark adaptation technic, E. L. BLANCHARD and H. A. HARPER (*Arch. Int. Med.*, 66 (1940), No. 3, pp. 661-669, fig. 1).—A new dark adaptation instrument, termed the regenometer, was used in the studies reported in which the course of dark adaptation was followed in 10 male college students during depletion and repletion of vitamin A stores. "The regenometer was designed as a diagnostic instrument that would be sensitive and accurate in the detection of subclinical vitamin A deficiency and at the same time be simple to operate and require a minimum of time per test. Its action is first to break down the visual purple of the retinal rods by a bright light and then to measure the speed with which this rod pigment is regenerated." The operation of the instrument is described in detail, and a statement is given of the specifications for the test conforming to the conditions which, according to Hecht, must be known in any valid studies of dark adaptation.

The time required to complete the test before depletion of body stores of vitamin A ranged from 1 to 3 min. as compared with from 4 to 24.5 min. after depletion. The depletion times ranged from 10 to 35 days. The improvement in dark adaptation following vitamin A administration, as shown by the regenometer reading, was at first rapid and then slower. In 2 subjects a daily supplement of only 500 U. S. P. units produced rapid improvement. In another

2,000 U. S. P. units seemed to be fairly close to the 24-hr. requirement. Massive doses up to 250,000 U. S. P. units were not proportionately more effective than the much smaller doses. No clinical symptoms of vitamin A deficiency were observed throughout the experiment.

Clinical evaluation of tests of dark adaptation, R. McDONALD and F. H. ADLER (*Arch. Ophthalmol.*, 24 (1940), Nos. 3, pp. 447-461, figs. 14; 6, p. 1258).—Based upon repeated examinations by one of the authors of the dark adaptation (Hecht apparatus) of a number of patients with various ocular diseases and a similar group of patients whose eyes were apparently normal but who were hospitalized for conditions in which vitamin A deficiency might be expected, conclusions concerning the reliability of these tests when definitely abnormal thresholds are obtained are summarized as follows:

"The subject is a poor observer, either due to inexperience or to lack of intelligence. Repeated tests will usually prove this, as the thresholds in such cases vary markedly from each other at the different examinations. The same or even greater care must be taken in interpreting dark adaptation thresholds as in interpreting visual field defects in poor observers. If the eye is apparently healthy and the subject a good observer, there must be some defect in the retina or its conducting fibers which present methods of examination fail to reveal or the retina is deficient in vitamin A. In the present state of knowledge it is entirely proper to say that this suggests a deficiency of the whole body in vitamin A, but until some correlation has been made between the vitamin A content of the blood and the deficient dark adaptation thresholds such conclusions are presumptive and not proved." Various case reports with accompanying light adaptation charts are included to illustrate the points made. From the experience with one subject who required several months to return to normal light threshold after 2 months' deprivation of vitamin A, the possibility is suggested that a marked deprivation of vitamin A may lead to irreversible changes and permanent damage to the light-adapting mechanism. "Such strenuous attempts to produce night blindness should certainly be approached with caution and a full understanding on the part of the experimental subject of the danger to which he is exposing himself."

Instruments and technics for the clinical testing of light sense.—IV, Size of pupil as a variable factor in the determination of the light minimum, L. L. SLOAN (*Arch. Ophthalmol.*, 24 (1940), No. 2, pp. 258-275, figs. 7).—In this continuation of the series noted previously (*E. S. R.*, S3, p. 710). measurements of the light threshold of the dark-adapted eyes of subjects with different sized pupils have shown that, within the accuracy of the measurements, retinal illumination is directly proportional to the area of the entrance pupil. In studies in which threshold determinations are made without standardization of the size of the pupil, this variable factor may be eliminated by applying a suitable correction factor to the results. A calibration curve has been worked out to correct threshold determinations to the values for a pupil 5 mm. in diameter. A camera and necessary apparatus for photographing the pupil in the dark are described. It is noted that correction for size of pupil is of special importance in testing subjects with abnormally small pupils and is of relatively little importance if the pupils are 5 mm. or more in diameter.

Influence of nutritional intake upon concentration of vitamin A in body tissues, H. C. KAO and H. C. SHERMAN (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 589-591).—This paper reports a reinvestigation of the question of the vitamin A content of the muscles of rats on diets of varying vitamin A content, as previously investigated by Baumann et al. (*E. S. R.*, 73, p. 565) with negative results and by Sherman and Boynton (*E. S. R.*, 54, p. 89) with

very low positive values. The rat tissues were assayed by the single feeding technic of Sherman and Todhunter, using controls receiving graded quantities of the official U. S. P. reference cod-liver oil and expressing the results in International Units. The findings were verified by simple direct interpolation and the use of a curve of response. The two diets used contained from 4 to 5 and from 16 to 20 I. U. of vitamin A per gram of dry food and were fed for periods of 30 and 60 days, with an average gain in the vitamin A content of the muscle on the diet with higher vitamin A content over that on the lower of 0.1 mg. per gram of dried tissue after 30 days and of 0.2 mg. per gram after 60 days. Although these differences are slight, the authors are of the opinion that the probability is greater that the differences are significant than that they are merely accidental. "Thus, there is a consistent trend of evidence of different kinds bringing cumulative support to the view that healthy muscle contains a small amount of vitamin A as a normal constituent and that the concentration of vitamin A in the muscle is in some measure influenced by the level of nutritional intake."

The vitamin B complex in normal nutrition, C. A. ELVEHJEM. (Univ. Wis.). (*Nature [London]*, 146 (1940), No. 3708, pp. 669-672).—The substance of this address has been essentially noted (*E. S. R.*, 85, p. 132).

Pathological conditions associated with lack of vitamin B complex: Histopathologic observations on rats fed a diet deficient in essential fats (*Alabama Sta. Rpt. 1939*, p. 27).—Gross and microscopic changes in the kidneys of rats showing hematuria on a fat-deficient diet are summarized by R. W. Engel.

Evaluation of vitamin B therapy for diabetes, L. B. OWENS, S. S. ROCKWERN, and E. G. BROWN (*Arch. Int. Med.*, 66 (1940), No. 3, pp. 679-687).—The 25 diabetic subjects of this investigation, with one or two exceptions, had been well standardized for from 6 to 18 mo. prior to the vitamin therapy. Thiamin in 3.3-mg. daily doses was administered by injection with the insulin to 20 of the subjects. After 8 weeks the dosage was increased to 5 mg. for 1 of the patients and to 8.3 mg. for another, and after 12 and 16 weeks, respectively, to 5 mg. for 2 other subjects. Other forms of therapy, with smaller numbers on each including some of those previously studied with thiamin, consisted of riboflavin 2 mg. daily by mouth, a combination of the thiamin and riboflavin therapy, and a crude acid-alcohol extract of powdered alfalfa leaves.

No evidence of benefit from any of the forms of therapy over many weeks was observed except a lessening of neuritic pains in 2 patients who had been under diabetic control only a short time before institution of the vitamin therapy. In only one of the patients was there any marked reduction in the insulin requirement, and this patient was the only one who was not standardized when the treatment began.

The authors conclude that in cases of well-controlled diabetes there seems to be no need for thiamin or riboflavin beyond the amounts provided by ordinary diabetic diets except in the case of diabetic neuritis, "a condition in which thiamin therapy seems to result in prompt improvement or cessation of the neuritic symptoms." It is suggested that severe vitamin deficiency may play a part in diabetic coma.

Thiamin and diabetes mellitus, K. A. SMITH and H. L. MASON (*Mayo Found. Med. Ed. and Rev., Proc. Staff Mtgs. Mayo Clinic*, 15 (1940), No. 34, pp. 529-532).—Observations were made on two patients with severe diabetes maintained on thiamin-deficient and later on thiamin-supplemented diets controlled as to carbohydrate (proportion at first low but later raised to increase thiamin requirement) and caloric value. A third patient with moderately severe diabetes was given injections of dextrose with and without thiamin. The findings as to urinary excretion of sugar and thiamin, blood sugar level, sugar tolerance tests,

and insulin doses required gave no grounds for the assumption that the level of intake of vitamin B₁ influenced either the intensity of diabetes or the sensitivity of patients with diabetes mellitus to the action of insulin.

Occidental beriberi with cardiovascular manifestations: Its relation to thiamin deficiency. S. WEISS (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 10, pp. 832-839, fig. 1).—The present status of knowledge of occidental beriberi with cardiovascular manifestations is reviewed, with the conclusion that beriberi with both nervous and cardiovascular manifestations exists in America and in Europe, with alcohol playing the significant predisposing role in the Occident as compared with polished rice in the Orient, and that the cardiovascular manifestations of beriberi are chiefly related to thiamin deficiency. The evidence of this relationship is summarized as "(1) thiamin deficiency in the diet, (2) decreased thiamin content in the urine, (3) disappearance of the disease after the administration of thiamin chloride, (4) induction of electrocardiographic changes in healthy men consuming a diet lacking only thiamin chloride, (5) induction in animals on a thiamin-deficient diet of cardiac disturbances, including cardiac dilatation, electrocardiographic changes, congestive failure of the circulation and structural changes similar to or identical with those observed in man, and (6) disappearance of the experimentally induced cardiovascular dysfunction in animals after administration of thiamin chloride."

Numerous literature references are given as footnotes.

Nutritive value of white flour with vitamin B₁ added and of wholemeal flour. H. CHICK (*Lancet [London]*, 1940, II, No. 17, pp. 511, 512, fig. 1).—A comparison was made of two groups of rats from the same litter, one group receiving 88 percent of straight-run white flour (73 percent extraction) and the other whole-wheat flour 82 percent and pure cornstarch 6 percent of the diet. The other constituents (purified casein, cottonseed oil, salt mixture, and cod-liver oil) were alike for the two groups except that 10 μ g. of vitamin B₁ daily was given as a supplement to the white flour diet.

During the first 2 weeks the animals on the white flour diet showed an average weekly gain per rat of 11.8 gm. as compared with 22.8 gm. for the animals on whole wheat. Food intakes for the two groups were 35.3 and 53.2 gm. (dry weight) and food utilization corresponding to 1 gm. increase in body weight 3.02 and 2.47 gm., or with allowance made for loss in feces 2.91 and 2.13 gm., respectively. The diets of the two groups were then reversed for another 2 weeks, with a resulting spurt in growth of the first group to an average of 24 gm. per rat per week and a decrease in growth of the second group to an average of only 7 gm. per rat per week, with corresponding shifts in food intake and utilization.

The inferiority of the white to the whole-wheat flour as shown in these experiments is attributed to a shortage in one or another of the B₁ vitamins. Preliminary trials suggest that the most serious deficiency is that of riboflavin, although lack of the filtrate factor may also have limited growth.

Superiority of wholemeal (*Lancet [London]*, 1940, II, No. 17, p. 523).—In this editorial comment on the study noted above the statement is made that "if we accept that these findings in rats are applicable to man, we may argue that the signpost points to whole meal as the highroad to better health and greater food economy, more particularly for the growing child but also for men and women. Political or economic considerations may make it impossible to take this road in wartime, but the general conclusion from the nutritional standpoint is not thereby affected."

Effect of cooking upon the vitamin B₁ content of two types of beans grown in Michigan. E. KELLY and T. PORTER. (Mich. Expt. Sta.). (*Food Res.*, 6 (1941), No. 1, pp. 85-93, fig. 1).—The vitamin B₁ values of Michelite and

Cranberry beans (*Phaseolus vulgaris*) were determined by the rat growth method in which the growth response of the animals was referred to an average curve of response constructed from the growth of positive control rats receiving 2, 4, or 6 μ g. of crystalline vitamin B₁ daily. The vitamin content of the two varieties of raw beans amounted to 1.7 and 0.9 International Units per gram of dry beans, respectively, but this varietal difference was not apparent in the beans after cooking. The boiling and baking processes employed resulted in cooked beans having more available vitamin B₁ than the raw beans, the vitamin B₁ content of the baked or boiled Michelite beans ranging from 2.3 to 3 I. U. per gram of dry beans, that of the baked or boiled Cranberry beans ranging from 1.9 to 2.9 I. U. per gram. Beans boiled in water in which they were soaked for 16 hr. showed no higher vitamin B₁ content than those boiled in fresh distilled water after a similar period of soaking. Soda used as a softening agent, but thoroughly rinsed off before cooking, shortened the boiling time from 5 to 15 min., but caused no destruction of vitamin B₁. Baked beans contained somewhat less vitamin B₁ than boiled beans.

Effect of a high-fat diet on the excretion of bisulfite-binding substances in the urine of rats deficient in vitamin B₁. G. G. BANERJI (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1329-1333, figs. 3).—The alleged sparing action of fat for vitamin B₁ was tested by comparing the excretion of bisulfite-binding substances (B. B. S.) on a vitamin B₁-deficient diet rich in fat (75 percent lard) and on the standard basal diet containing 15 percent peanut oil as the fat source. With both diets 2 drops of cod-liver oil were given daily to each rat. The Cliff and Cook method of determining B. B. S. was followed with the same technic as in an earlier study of Banerji and Harris (*E. S. R.*, 83, p. 851), except that in one of the experiments 5 cc. of 15 percent Na₂HPO₄ was used in place of the same quantity of saturated NaHCO₃ as the alkali for breaking down the bound bisulfite. This modification was found to result in a more sharply defined end point and has been adopted in later work. As another test, heart rates were taken with the electrocardiograph, as described by Birch and Harris (*E. S. R.*, 73, p. 567).

On the high-fat vitamin B₁ diet the excretion of bisulfite-binding substances in the urine was decreased, and the changes in the heart rate became insignificant as compared with the results on the low-fat diet. Following the intraperitoneal injection of thiamin in 5 μ g. doses there was a slow rise in bisulfite-binding substances in the controls, but no rise in the high-fat group. Daily supplements of 10 μ g. almost completely suppressed the rise of bisulfite-binding substances.

The significance of these results for vitamin B₁ assays and for the assessment of vitamin B₁ deficiency in human beings is discussed, with emphasis on the necessity of taking into consideration the composition of the basal diet with respect to fat in animal feeding tests and of adequately controlling the basal diet of individuals undergoing the carbohydrate tolerance test (cocarboxylase function) for detecting vitamin B₁ deficiency (*E. S. R.*, 83, p. 851).

The relief of symptoms of major trigeminal neuralgia (tic douloureux) following the use of vitamin B₁ and concentrated liver extract. H. BORSOOK, M. Y. KREMER, and C. G. WIGGINS (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 15, pp. 1421-1423).—This report covers an investigation extending over more than a year of the effects of large doses of vitamin B₁ in some cases supplemented with a concentrated liver extract rich in the antipernicious anemia principle, in the treatment of tic douloureux and other types of facial neuralgia. The vitamin B₁ was given intravenously in daily doses of 10 mg. of thiamin chloride, and the liver extract, when indicated, in 0.5-cc. doses of a concentrate containing 15 U. S. P. antianemia units per cubic centimeter intramuscularly three times a week. In most but not all of the cases 30 cc. daily by mouth of an aqueous concentrate of

rice polishings was also given. A diet high in vitamins and low in carbohydrate (E. S. R., 80, p. 426) was prescribed.

Of the 58 patients with tic douloureux under observation for from 6 to 14 mo., 37 showed marked improvement, 15 improvement, 3 slight improvement, and 3 no improvement. Of the 37 showing marked improvement, 5 had relapses after from 3 to 9 months' freedom from pain, and in 4 of these relief from the extreme pain occurred within 1 or 2 weeks after resumption of vitamin B₁ treatment. Of the 52 described as showing either marked improvement or improvement, 38 had longer remissions during or after active therapy than any spontaneous remission during the 2 yr. before the beginning of the improvement.

Among 4 patients with sphenopalatine neuralgia receiving similar treatment, 2 were markedly improved and 2 improved, and among 9 cases diagnosed as typical facial neuralgia, 6 showed no improvement and 3 possibly moderate improvement.

Choline as a member of the vitamin B₁ complex, P. GRÖRGY and H. GOLDBLATT (*Jour. Egypt. Med.*, 72 (1940), No. 1, pp. 1-10, pls. 2).—Data are presented which not only substantiate the need for the incorporation of choline in synthetic rations for rats used in the study of the vitamin B₁ complex, as previously indicated by Oleson et al. (E. S. R., 81, p. 450), but also emphasize the important relationship between the content of choline and the proportion of cystine to methionine in the diet, as suggested by the work of Griffith and Wade (E. S. R., 81, p. 869) and du Vigneaud et al. (E. S. R., 84, p. 274).

Further investigations on vitamin B₁ and related factors of the vitamin B₁ complex in rats, I, II, P. GRÖRGY and R. E. ECKARDT (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1143-1154, figs. 2).—Considerable attention is given in part 1 to the use of a diet for the production of acrodynia containing 10 percent of egg white heated over a steam bath for 3 hr. to destroy the toxic effect known as egg white injury. On a basal diet consisting of casein 18, sucrose 58, butterfat 8, cod-liver oil 2, and salt mixture 4 parts, supplemented with 20 µg. each of synthetic vitamin B₁ and synthetic riboflavin, acrodynia was found to develop more rapidly and frequently than on one with 68 percent sucrose and no egg white.

In part 2, dealing with vitamin B₁ and cutaneous lesions in rats, earlier work on the isolation of the vitamin and its biological effects is reviewed, and preliminary observations in prophylactic and therapeutic tests (E. S. R., 83, p. 713) are confirmed, with renewed emphasis on the observation that vitamin B₁ is only one of the factors influential in the cure or prevention of cutaneous manifestations in rats kept on the experimental diets heretofore used for the production of rat acrodynia.

The effect of complementing factors on the quantitative response and specificity of vitamin B₁, G. C. SUPPLEE, R. C. HENDER, and O. J. KAULENBURG (*Jour. Nutr.*, 20 (1940), No. 2, pp. 109-123, pl. 1, figs. 3).—Data are reported confirming the observations of Schneider et al. (E. S. R., 84, p. 422) that vitamin B₁ does not permit continued growth in rats or prevent acrodynia and exfoliative dermatitis of the extremities associated with lack of this vitamin except in the presence of an unidentified factor or factors contained in the rice polish concentrate designated as filtrate factor II of Lepkovsky et al. (E. S. R., 76, p. 839).

When a basal vitamin B complex-free diet supplemented with 12.5γ of pure vitamin B₁ and 10γ of pure riboflavin per rat per day was fed from the day of weaning, acrodynia developed in from 75 to 100 percent of the test rats within from 6 to 8 weeks and growth at a rate of about 8-10 gm. per week was maintained for about 3 weeks, after which the weights remained prac-

tically constant or declined slowly. The addition of vitamin B₆ up to 10 γ per day or of the autoclaved rice polish factor II up to 100 mg. per day stimulated growth for only 2 or 3 weeks, but the same quantity of vitamin B₆ plus graded amounts of the rice polish factor stimulated gains proportional to the amount of the latter, 100 mg. being required for normal gains of from 12 to 15 gm. per week.

A distinction is made in the observations recorded between typical acrodynia, "the edematous exudative or florid dermal lesions with loss of fur on the paws, with or without accompanying involvement of the nose, mouth, and ears" and nontypical acrodynia, "the exfoliative dermatitis or dry scaliness of the paws." The two forms, however, are thought to be "merely degrees of severity resulting from inadequate amounts, or a disbalanced relationship between vitamin B₆ and another complementing factor or factors contained in the autoclaved rice polish factor II."

Riboflavin deficiency: Report of a case in a child with cure by specific treatment. W. P. SHIELDS (*New England Jour. Med.*, 223 (1940), No. 6, pp. 215-216, figs. '2).—Riboflavin deficiency, as evidenced by cheilosis responding to special riboflavin treatment, is reported for a 6-year-old girl of Italian descent from a family of low economic status.

Antiscorbutic values of fruits and vegetables. M. OLLIVER (*Lancet* [London], 1940, II, No. 7, pp. 190-192).—Summaries of data and general conclusions, based on some hundreds of analyses made over a period of years, are presented with respect to factors influencing the ascorbic acid values of fruits and vegetables as generally eaten. The variation between samples of similar fruits and between different parts of the same sample, the destruction of the vitamin by drying, the relatively large amount extracted but relatively small amount actually destroyed in cooking, the increased destruction of the vitamin with longer periods of cooking and increased quantity of cooking water, the relatively small destruction by soda used in cooking as compared with cooking losses due chiefly to extraction, canning losses due chiefly to the preliminary blanching rather than to subsequent processing, and the fairly great resistance of the vitamin to destruction by the heat treatment in the boiling of jam—all of these are points considered.

The analysis of Ceylon foodstuffs.—VIII, A, Further investigations on the vitamin C contents of local fruits, fruit products, and vegetables; B, The composition of red and white-testaed rices. A. W. R. JOACHIM and D. G. PANDITSEKERE (*Trop. Agr. [Ceylon]*, 95 (1940), No. 3, pp. 136-141).—These two studies are in continuation of the series noted earlier (*E. S. R.*, 83, p. 700). Vitamin C values, determined by a method essentially that of Bessey and King, are reported for 5 fruit products and 5 vegetables. The rices (13 samples), some polished, others partly or well-polished, were analyzed for moisture, ash, protein, phosphorus, and calcium.

The vitamin C content of the fruits and leaves of *Juglans regia* and *J. nigra* [trans. title], K. HENNIG and P. OHSKE (*Biochem. Ztschr.*, 306 (1940), No. 1, pp. 16-23).—The vitamin C contents of young and older fruits and leaves of the Persian and black walnuts were determined by the dichlorophenol-indophenol titration procedure at 14-day intervals. The vitamin C content of the fruits decreased markedly until at maturity the value was only about one-fifth of the initial value. The decrease in the leaves was less marked than in the fruits. Data obtained, together with a few data from sources cited, are summarized, these values indicating that green husks of *J. regia* and *J. nigra* could contain, respectively, as much as 950-1,000 or 1,050-1,250 mg. of ascorbic acid per 100 gm.; 250-370 and 350-390 mg. per 100 gm. were found in the

leaves of the two species, respectively. The green nuts, with shell still unhardened, contained in the case of *J. nigra* as much as 1,550-1,650 mg. of ascorbic acid per 100 gm. of material. The conserved (sweet) nuts were devoid of vitamin C. Dried leaves of *J. regia* after prolonged storage still contained 86 mg. of ascorbic acid per 100 gm. of material.

The effect of different cooking methods on the vitamin C content of quick-frozen vegetables, J. A. MCINTOSH, D. K. TRESSLER, and F. FENTON. (N. Y. State Expt. Sta. and Cornell Univ.). (*Jour. Home Econ.*, 32 (1940), No. 10, pp. 692-695).—Vitamin C determinations, using the method of Mack and Tressler (E. S. R., 78, p. 154) and carried out on subsamples of quick-frozen vegetables before cooking and on the cooked vegetables and the cooking water, showed that vitamin C destruction during cooking was less than 15 percent in all experiments except that of lima beans cooked in a pressure cooker, in which case the destruction amounted to 36 percent. In the case of vegetables boiled in a covered aluminum saucepan, where leaching of the vitamin into the cooking water was the greatest, the amounts found in the cooking liquid were 14, 23, 31, 18, and 26 percent of the amounts originally present in uncooked frozen brussels sprouts, cauliflower, lima beans, peas, and spinach, respectively; 77, 81, 62, 70, and 70 percent, respectively, were retained in the cooked vegetables. Cooking in a pressure saucepan permitted the greatest retention of the vitamin, amounting, in the order above noted, to 97, 92, 75, 88, and 80 percent, respectively. Two types of steamers gave the same results with peas and spinach, from 68 to 73 percent of the vitamin being retained and from 18 to 21 percent being leached out, but brussels sprouts and cauliflower retained, respectively, 94 and 83 percent of the vitamin when cooked in the steamer in which the steam condensed on the vegetables and 89 and 71 percent, respectively, in the steamer constructed to allow the condensed steam to drip back into the boiler. The appearance and flavor of the vegetables were excellent in all cases.

Vitamin C content of tomatoes, A. P. BROWN and F. MOSER (Utah Expt. Sta.). (*Food Res.*, 6 (1941), No. 1, pp. 45-55).—Utah-grown Stone tomatoes from five different experimental plats were analyzed over three seasons. Titration values on samples analyzed immediately after being received at the laboratory averaged 26.2 ± 0.39 mg. per 100 gm. Samples from any one plat showed small but irregular increases in weekly averages with advance of the season, and there was some indication that very small tomatoes were richer in vitamin C than very large ones. In neither case, however, was the evidence conclusive. Tomatoes held for as long as 18 days either at laboratory temperature or in the refrigerator at 44° F. showed no vitamin C loss. The vitamin C content of tomatoes from pole-supported vines averaged significantly higher than that of tomatoes from adjacent vines which were not supported, and greenhouse tomatoes showed a mean vitamin C value approximately one-half as great as that of the same variety grown in an outdoor plat near the greenhouse.

Assessment of the level of nutrition: Tests of vitamin C on groups of poorly fed and well-fed school-children, L. J. HARRIS (*Lancet [London]*, 1940, II, No. 9, pp. 259-262, 263, figs. 5).—The simplified procedure of Harris and Abbasy (E. S. R., 78, p. 729) for assessing nutritional status with respect to vitamin C in school children is reproduced, with an example of its application in a comparative survey of a poorly fed group and a well-fed group of boys from 11 to 13 yr. of age in the same town. Methods of calculating the incidence of deficiency of vitamin C are explained with illustrative data from the present study and an earlier study by Ahmad and Harris with an intermediate group, some of the subjects of which were also represented in the better-fed group of

the present study. The difference in the diets of these two groups consisted in the addition of an orange a day to the earlier diet. The effect of this addition was apparent in the higher responses to the standard test doses.

The validity of the method as a quantitative measurement of the degree of saturation, the relation of the resting level to the degree of saturation, the specificity of the titration method, and the phenomenon of irregular drops in the excretion values after long-continued test doses are discussed.

The excretion of homogentisic acid and other tyrosine metabolites by the vitamin C-deficient guinea pig, R. R. SEALOCK and H. E. SILBERSTEIN (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 251-258, figs. 3).—In further experiments on the effectiveness of ascorbic acid in preventing the excretion of homogentisic acid by guinea pigs (E. S. R., 82, p. 712), the feeding of *L*-tyrosine or *L*-phenylalanine in amounts of 0.5 gm. or more daily to guinea pigs on a vitamin C deficient diet was followed by the excretion of homogentisic acid and *p*-hydroxyphenylpyruvic and *p*-hydroxyphenyllactic acids. When the ascorbic acid was given in amounts of 5 or 10 mg. per animal per day these substances practically disappeared within 48 hr. and after a 1-gm. dose within 72 hr. The effectiveness of ascorbic acid in small doses depended upon the state of vitamin C saturation. In one animal 0.5 mg. proved sufficient to prevent the excretion of the metabolites until scurvy developed. The metabolites then gradually increased in the urine, again disappearing with a larger dose of the vitamin. In another case in which the guinea pig was definitely scorbutic when the 0.5 mg. dosage was given there was no response until the dose was increased. These findings are in agreement with Levine et al. (E. S. R., 82, p. 711), who obtained evidence suggesting that the disturbance in nitrogen metabolism occasionally found in premature infants is an interrelated function of the level of phenylalanine and tyrosine and the degree of saturation of the tissues with vitamin C.

The ascorbic acid isomer *D*-isoascorbic acid proved ineffective in replacing the same amount (10 mg.) of *L*-ascorbic acid, but 200 mg. of the isomer, an amount equivalent to 10 mg. of the natural vitamin in antiscorbutic activity, prevented the excretion of the metabolites.

Estimation of vitamin D in blood serum.—II, Level of vitamin D in human blood serums, J. WARKANY and H. E. MABON (*Amer. Jour. Diseases Children*, 60 (1940), No. 3, pp. 606-614, figs. 2).—Continuing the study previously reported by Warkany (E. S. R., 77, p. 889), the present paper gives additional data on the level of vitamin D in human serum, as determined by assay of 155 samples of human blood over a period of several years. These samples were obtained from 63 white adults and 48 white and 44 Negro children. In the line test procedure outlined, 1.5, 2, 2.5, 3, 3.5 and 4 cc. of serum were administered to various groups of rachitic rats (21 days' feeding with Steenbock-Black diet No. 2965). In the line tests 13.6 percent showed ++ healing (or more) when 1.5 cc. of the serum was fed and this percentage, as shown by the curve and the data reported, increased steadily up to 83.1 percent of ++ tests when the 4 cc. of serum was given as the healing dose. Assaying each blood at these several levels is considered, therefore, to furnish satisfactory average figures. From 89 such "complete" bio-assays of human blood serum, an average vitamin D content of 116 U. S. P. units per 100 cc. (range 60-165) was calculated. When the results of all valid line tests (a total of 608) were considered, an average of 110 U. S. P. units per 100 cc. was calculated. Serums of adults did not differ appreciably from those of children in vitamin D content, and no marked seasonal variations could be demonstrated. The values found for white children were about 15 percent above those obtained for Negro children.

The relation of vitamin D intake to the age of the infant at the time of eruption of the first deciduous incisor, T. D. SPEIDEL and G. STEARNS (*Jour. Ped.*, 17 (1940), No. 4, pp. 506-511, fig. 1).—The age of eruption of the first deciduous lower central incisor of three groups of healthy infants numbering 17, 22, and 6 individuals receiving, respectively, low, intermediate, and high vitamin D intakes (from 135 to 270, from 300 to 400, and over 1,800 units daily, respectively) with carefully controlled diets, averaged 28.3, 24.7, and 27.2 weeks for the respective groups. For a fourth group of 6 infants with severe acute or mild chronic illnesses and receiving the 300- to 400-unit intake of vitamin D, the mean age of incisor eruption was 29.0 weeks.

Progress of hypervitaminoses D₂ and D₃ and recovery in rats, as affected by dietary calcium and phosphorus and vitamin A, A. F. MORGAN, N. SHIMOTORI, and J. B. HENDRICKS. (Univ. Calif.). (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 761-779, figs. 6).—These studies were conducted with the use of purified diets of varying calcium and phosphorus content and with the use of four vitamin D sources (two designated as vitamin D₂ and two as vitamin D₃), fed at various levels and given in amounts just sufficient to produce detectable toxic effects in a relatively brief period. The diets were planned to contain adequate amounts of the several B vitamins, the vitamin A intake was varied, and in one series an attempt was made to equalize the magnesium content of all diets.

Growth response and data on serum Ca and P and femur ash are interpreted as indicating that the levels of both calcium and phosphorus and their ratio in the diet were of main importance in the production of normal femur calcification regardless of normal or excess amounts of vitamins D₂ or D₃ or chronic moderate hyperthyroidism produced by the injection of parathyroid extract. Neither excess nor minimum doses of vitamin D nor parathyroid extract mitigated the damaging effects of the low-phosphorus purified diet. The low-calcium diet did not produce normal bone in any case, but with excess vitamin D it did produce more nearly normal soft tissue growth. Normal kidney structure occurred in the latter groups, but damaged tubules were found in the controls without vitamin D. Chronic mild parathyroid treatment had but little harmful effect and even seemed beneficial with the low-phosphorus diet. Excessive amounts of irradiated ergosterol or calciferol were most harmful with a diet of normal calcium and phosphorus content and ratio, and were also toxic with the adequate-calcium, low-phosphorus diet, but had favorable results with the low-calcium, adequate-phosphorus diet. Irradiated animal sterol (delsterol, presumably vitamin D₃) produced even more striking damage from which recovery was more rapid and complete, however, than was the case with excess vitamin D₂. Low vitamin A intake allowed greatly increased tissue calcification and other damaging effects of hypervitaminosis D.

Vitamin E: A symposium held under the auspices of the food group (nutrition panel) of the Society of Chemical Industry, April 1939 (*Cambridge, Eng.: W. Heffer & Sons*, [1939], pp. VIII+88, figs. 2).—This monograph, edited by A. L. Bacharach and J. C. Drummond, embodies papers by numerous contributors. The three sections deal respectively with (1) the chemical structure and properties of tocopherol (vitamin E), including chemical tests and a comparison of methods proposed for the estimation of vitamin E activity; (2) the physiological action of vitamin E and the consequences of vitamin E deficiency; and (3) the clinical and veterinary uses of wheat-germ oil and vitamin E preparations. A bibliography of 165 references is appended.

The effect of vitamin E deficiency on the vitamin A reserves of the rat, T. MOORE (*Biochem. Jour.*, 34 (1940), No. 8-9, pp. 1321-1328).—The vitamin A

reserves in the livers of rats kept for a long time on a diet deficient in vitamin E and with vitamin A supplied as halibut-liver oil were universally lower than those of controls receiving vitamin E supplements. When carotene was substituted for vitamin A, the differences between the vitamin A storage of the animals treated and not treated with vitamin E were less marked.

Effect of alpha-tocopherol on lesions of skeletal muscles in rats on vitamin A-deficient diets. C. KRAKOWER and J. H. AXTMAYER (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 583-586).—Degenerative lesions of the skeletal muscle in rats on vitamin A-deficient diets have been prevented by the administration of α -tocopherol and are consequently attributed to the absence of vitamin E in the basal diet. It is concluded that vitamin E or α -tocopherol should form a part of basal diets used to produce vitamin A deficiency in rats.

Vitamin E (synthetic alpha-tocopherol) therapy in certain neurologic disorders. C. H. SHELDEN, H. R. BUTT, and H. W. WOLTMAN (*Mayo Found. Med. Ed. and Rev., Proc. Staff Mtgs. Mayo Clinic*, 15 (1940), No. 37, pp. 577-580).—Eighteen patients with neuromuscular disorders were given vitamin E in large doses (45 cc. of wheat-germ oil orally at each meal plus intramuscular injections of 100 mg. of α -tocopherol in sterile peanut oil twice weekly) over periods of 3-5 mo. In none of the subjects, including 8 with progressive muscular dystrophy, 6 with amyotrophic lateral sclerosis, and 4 with progressive muscular atrophy, was there any definite evidence of improvement. These negative results are not interpreted as failure of the therapeutic agents, since it is considered that the period of treatment may not have been long enough and that the presence of excess of other vitamins may be necessary for effective action of vitamin E. Therapy of the 18 patients is being continued.

The absorption of water-soluble vitamin K without the aid of bile salts. H. P. SMITH and C. A. OWEN (*Jour. Biol. Chem.*, 134 (1940), No. 2, pp. 783-784).—The water-soluble hydrochloride of 4-amino-2-methyl-1-naphthol, previously shown by Emmett et al. (*E. S. R.*, 84, p. 715) to have an activity but little greater than that of the fat-soluble forms of vitamin K, was administered daily in 1-mg. doses to a number of patients with chronic obstructive jaundice. The low plasma prothrombin values of these subjects responded within 24 hr. and were brought to normal values by this treatment in from 4 to 5 days. This rapid response indicated that the compound was readily absorbed, and that bile salt medication, which tends to create nausea in the patient, was not necessary.

Comparative activities of certain antihemorrhagic compounds. H. J. ALMQUIST and A. A. KROSE. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 55-59).—The results of assays of a number of derivatives of 2-methyl-1,4-naphthoquinone are reported in terms of a common reference standard (a hexane extract of dried alfalfa equivalent in potency to 1 gm. of dried alfalfa per cubic centimeter). The antihemorrhagic activity of 1 cc. of this reference standard is equivalent to that of 5 μ g. of 2-methyl-1,4-naphthoquinone.

Vitamin P in vascular purpura. I. N. KUGELMASS (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 7, pp. 519-520).—The chemistry of vitamin P first postulated by Szent-Györgyi and associates (*E. S. R.*, 77, pp. 739, 740) is reviewed, and several case reports are given showing the effectiveness of vitamin P concentrate in the form of a solution of eriodictyol glucoside and hesperidin in the treatment of two children with infectious purpura and an infant with nutritional purpura, and the effectiveness of the same concentrate in the treatment of three cases of mechanically produced purpura. "Vitamin P constitutes another

valuable adjuvant in the management of vascular purpura, provided the underlying cause is cleared."

HOME MANAGEMENT AND EQUIPMENT

Home production of food for family consumption, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 4, pp. 1, 8).—A comparison of the amounts of foods produced and consumed during 1938-39 by young farm families in a poor agricultural area of the State with recommendations of the Extension Service for consumption, based on the standards of the U. S. D. A. Bureau of Home Economics, showed that all of the families were considerably below normal requirements. The owner families produced the most and the sharecroppers the least food. Two-thirds of the owner families, half of the share renters, and only one-third of the croppers produced enough milk for home use. Less than half of the owner families, less than one-third of the share renters, and only one-fourth of the cropper families produced enough pork. Consumption of farm-grown vegetables and fruits, eggs, poultry and other meats, sirup, and corn meal was low in all groups. Among the factors in addition to low production responsible for this were poor storage facilities resulting in losses of certain home-produced foods, notably sweetpotatoes, and the use of home-produced foods as money crops. A home-production program with proper storage facilities is urged as a defense measure.

Home production of food supplies (*Tennessee Sta. Rpt. 1939*, pp. 13-16).—This report summarizes the data for 1939 obtained by J. J. Bird on the dietary food and total farm costs, income from sales of crops and livestock, and relation of acreage of potatoes to cash profits on the 12 Crossville Homestead farms (E. S. R., 83, p. 561).

Purchases and consumption of specified foods in three Alabama towns (*Alabama Sta. Rpt. 1939*, pp. 7-9).—In a report by J. H. Blackstone tables show that during a 1-yr. period in three towns with estimated populations of 6,530, 2,535, and 684, the respective values per person of vegetables purchased were \$9.67, \$7.19, and \$4.25, and of livestock products \$33.60, \$29.06, and \$22.35.

MISCELLANEOUS

Fiftieth Annual Report [of Alabama Station], 1939, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1939*, pp. 43, fig. 1).^a

Annual Report of [Nevada Station], 1940, S. B. DOTEN ET AL. (*Nevada Sta. Rpt. 1940*, pp. 42, figs. 7).^a

Fifty-second Annual Report [of Tennessee Station], 1939, [C. A. MOOERS ET AL.] (*Tennessee Sta. Rpt. 1939*, pp. 80, figs. 11).^a

Fifteenth Annual Report [of Washington Station], 1940, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 394* (1940), pp. 124).^a

Report of agricultural research and other activities of the Western Washington Experiment Station for the fiscal year ended March 31, 1940, J. W. KALKUS ET AL. (*Western Washington Sta. Rpt. 1940*, pp. 64, fig. 1).^a

What's new in farm science: Annual report of the director, [Wisconsin Station, 1940], II, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 451* (1941), pp. [2]+112, figs. 37).—This supplements and completes the report previously noted (E. S. R., 83, p. 718) dealing with the subjects of field crops; livestock feeding; poultry; insect pests; plant diseases; garden, orchard, and cash crops; and soil fertility.^a

^a The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Georgia Station.—Dr. K. H. Garren, assistant professor of biology at the State Teachers College of Jacksonville, Ala., has been appointed associate botanist vice Dr. W. A. Jenkins, who has accepted a similar position in the Virginia station. T. I. Olsen, assistant food technologist at the Tennessee Engineering Experiment Station, has been added to the staff and will work on frozen foods and food processing.

Cornell University.—A School of Nutrition has been established, offering a 2-year curriculum for students who have completed 3 years of preparation at the college level. Its scope will include all phases of animal and human nutrition, and it will bring to bear on nutrition problems facilities now distributed in various parts of the university and the recently established U. S. D. A. Regional Nutrition Laboratory. Dr. L. A. Maynard, director of this laboratory, has been appointed director of the new unit.

The animal nutrition laboratory has been granted \$60,000 to continue its research on degenerative diseases and age changes. A long-time research program will be set up with these funds.

Chester J. Hunn, assistant professor of ornamental horticulture, died early in July in his fifty-eighth year. A graduate of the university in 1908, he had been assistant horticulturist of the Hawaii Station from 1908 to 1914, professor of horticulture in the University of Puerto Rico from 1914 to 1916, and assistant horticulturist in the U. S. D. A. Bureau of Plant Industry from 1919 to 1926. His work at the university during the ensuing 13 years had been mainly in plant propagation and nursery management.

Pennsylvania College.—Dr. Harvey A. Surface, professor of zoology from 1900 to 1907, State zoologist from 1903 to 1917, and professor of nature studies at Susquehanna University from 1919 to 1932, died in Danville, Pa., on July 8 in his seventy-fourth year. He had also been associated with Cornell University and other institutions in zoological and nature study work. Among other subjects he was regarded as an authority on bee culture.

Utah College and Station.—Dr. Fred F. McKenzie, assistant professor of animal husbandry and assistant animal husbandman in the Missouri University and Station and recently engaged in developing a special research program for sheep breeding in the mountainous area of Chile and Peru under the auspices of the Committee for Inter-American Artistic and Intellectual Relations and the National Research Council, has been appointed head of the department of animal husbandry vice Dr. R. W. Phillips, who has returned to the U. S. D. A. Bureau of Animal Industry to supervise its animal breeding and genetics research and coordinate it with that of the regional laboratories dealing with sheep, swine, and poultry improvement.

Washington College and Station.—Howard Hackedorn, professor of animal husbandry and head of the department since 1918, died June 30, aged 55 years. Born in Missouri in 1886, he graduated from the University of Missouri in 1910 and served there as instructor and assistant professor of animal husbandry for 8 years. His special interest was in sheep and wool production.

EXPERIMENT STATION RECORD

VOL. 85

NOVEMBER 1941

No. 5

SOME ADDITIONAL BIBLIOGRAPHIC AIDS IN AGRICULTURAL RESEARCH

As the years go by, their cumulative effect on the volume of literature pertaining to agriculture makes essential the development of more and more indexes, title compilations, and many other types of bibliographical aids. This need has been more or less generally recognized, and the number and scope of such aids is already extensive. Publications of this type, however, are still likely to be at least deferred, especially when funds are difficult to secure even for the publication of new findings, and a specialized knowledge and skill is required for much of the work which all too frequently is not available. It is therefore not surprising that many gaps still exist in the bibliographical structure, and when some of these are adequately filled it is a matter worthy of special notice.

Recently two such aids have appeared. One of these is a 30-year index to *Phytopathology*. The other is a so-called "Numerical List" of the publications of the Federal Department of Agriculture.

The index to *Phytopathology* is published by the American Phytopathological Society and covers the entire files of that journal as issued from 1911 through 1940. Its 30 volumes had already been indexed separately, but, as is usual in such indexes, the work had been done by many individuals and there was a consequent diversity in treatment. Not only had the physical disadvantage of consulting 30 indexes become burdensome, but the shortcomings as regards uniformity were an even greater handicap. The society therefore set up in 1939 a committee, headed by Dr. Frederick V. Rand of the Office of Experiment Stations, which organized a complete reindexing and consolidation. The task of indexing the individual volumes was apportioned among 21 members of the society, and ultimately their entries were edited and combined by Dr. Rand as editor into a volume of 335 pages. The total number of entries in the volume is 30,900.

In its final form a dictionary-type subject-author index has been prepared. This provides three avenues of approach to the parasitic diseases, viz, via the scientific name of the pathogen, the common name of the disease, if any, and the host or hosts. Furthermore, information of special importance or general applicability often appears not only under the specific subject headings but under more

general rubrics as well. Special care at inclusiveness is given to such broad subjects as distribution (geographic), viruses, disseminators of infection (insects, seed, air, etc.), resistance, physiologic races, mycorhizas, biographies, portraits, technic, etc., and selected items of special interest are also included under many other general headings.

It is of interest to note that, even with the generous space limits accorded, complete coverage for all general subjects was found to be out of the question. "For example, if every trial of chemicals for disease control had been entered under 'Fungicides,' that portion of the index would have become unwieldy and largely unusable. Therefore, under headings of this type only material that is widely applicable or otherwise of very special interest is included. Other examples of rubrics covering only selected items are Bacteria, Taxonomy, Diseases, Physiology, Sprays, Spores, Bibliographies, Fertilizers, Hydrogen-ion Concentration, Temperature, Trees, etc. To get at many of the valuable contributions under such headings recourse must be had to more specific rubrics. In the case of a fungicide, for instance, one would probably find most references under the names of the particular hosts, diseases, or pathogens on which it was tried."

Essentially this practice is necessarily followed in indexes of abstract journals and similar publications. It is, however, a further indication of the amount of ground covered within the past 30 years by this single phase of agricultural science.

The Numerical List of Current Publications of the United States Department of Agriculture is a specialized publication with a specific purpose. It "is intended for use strictly as a 'working list' for institutions and persons engaged in informational service, such as libraries, editorial offices, information specialists, and correspondence clerks handling requests for material relating to agricultural subjects."

The reason for this voluminous list of 929 pages is to be sought in the fact that since its establishment in 1862 the Department has issued many series of publications, each numbered beginning with No. 1 and consequently easily confused unless care is observed to take into account the particular series. Not only are there many series of Department Bulletins, Technical Bulletins, Farmers' Bulletins, Circulars, Leaflets, and the like, but, in the early days, similar series of the various bureaus and other subdivisions of the Department. For example, under the head of No. 1 may be found 119 distinct publications. As is stated by the authors of the compilation, Mr. Fred L. Zimmerman and Miss Phyllis R. Read of the Office of Information, "one assigned to handle an enormous amount of correspondence requesting information that is supplied by the selection of appropriate publications can readily appreciate the difficulty that arises in identifying the material desired when only a number is given, or when the num-

ber and an incorrect reference to its title, or other scanty information, are supplied." Primarily to obviate this difficulty the list has been compiled, bringing together under each number the series, title, author, issuing bureau, and date of issuance of each current publication of the Department that bears a numerical designation.

The total number of publications so listed is not stated, but may be roughly estimated as over 8,000. To this, of course, would have to be added the considerable number of unnumbered publications if a complete measure of the Department's service in this field were desired.

The introductory announcement makes plain that the list is not to be regarded as a complete list of the publications of the Department that are available for distribution. Most of the earlier publications have long since been exhausted, and many have been replaced by others. Nor is the list intended for general distribution, although available from the Superintendent of Documents, Government Printing Office, at \$1.75 per copy. Nevertheless, for the purposes for which it is designed it will doubtless be very useful.

Despite the chronic shortage of space available for abstracts in *Experiment Station Record*, a minor change in procedure which will be of interest to librarians, compilers of bibliographies, and others dealing with citations to the literature has been decided upon. This is to include in all abstracts the title of the original article as given, instead of using only an English translation of those in foreign languages. The translated title will also be given, however, in all cases not readily understood. The aim is of course to facilitate reference work and permit of direct citations. The change has long been desired by librarians and others, and the only objection has been because of the additional space necessary. It will become effective with Volume 86, which begins with the issue of January 1942.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Electrokinetics.—XXII, Electrokinetic potentials of barium sulfate in solutions of electrolytes and in fifty per cent ethanol, R. G. RUYSSSEN. (Minn. Expt. Sta.). (*Jour. Phys. Chem.*, 44 (1940), No. 3, pp. 265–275, figs. 3).—Continuing work previously noted (E. S. R., 52, p. 723), the streaming potentials on precipitated and negatively charged barium sulfate show a charge reversal by barium chloride solution, the ζ -potential-concentration curve being a typical one for the adsorption of a potential-determining ion. The adsorbed barium ions are liberated, and desorption of barium ions takes place in a strong potassium chloride solution ($M/10$). The positive potential curve displayed a great charge increase in 50 percent ethanolic solutions of barium chloride and barium nitrate. The charge reversal of the negative barium sulfate was also observed for potassium bromate and potassium chloride in 50 percent ethanol.

Electrokinetics.—XXIII, Electrokinetics as a tool for the study of the molecular structure of organic compounds, R. A. GOETNER. (Minn. Expt. Sta.). (*Faraday Soc. Trans.*, 36 (1940), No. 1, pp. 63–68, fig. 1).—The electrical forces in the double layer between homologous series of aliphatic alcohols, aliphatic acids, and aliphatic esters in contact with cellulose and Al_2O_3 , as measured by the streaming potential method, are tabulated and discussed. It is pointed out that these values in some instances show greater physicochemical differences between members of a homologous series than does any other physical or chemical value which has been reported, and that accordingly electrokinetic data offer an important and independent method for studying differences in molecular structure.

The metaphosphoric acid-protein reaction, D. R. BRIGGS. (Minn. Expt. Sta.). (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 261–272, figs. 4).—In further work on metaphosphate protein precipitation (E. S. R., 79, p. 205), the author finds that the metaphosphate content of the protein-metaphosphate complex depends on the metaphosphate concentration of the equilibrium liquid in a manner described by the adsorption isotherm. A saltlike, slightly ionizing combination between the polyvalent metaphosphate ion and the basic groups of the protein is, however, clearly involved. Formation of this complex leads to a masking of the amino groups of the protein and a shift in the dissociation constant of the carboxyl groups to a pH region in which they may be readily titrated. At relatively low metaphosphate content of the complex, this new buffer segment reaches a maximum value which closely approximates the acid-binding capacity of the protein. Further increase in the metaphosphate content of the complex has no more effect on the titration curve. The complex shows many of the characteristics of a complex coacervate. No similar reaction occurs between metaphosphate ion and amino acids or other low molecular weight substances containing single basic groups.

Studies on wheat starch.—IV, Fractionation and amylase hydrolysis, O. EL STAMBERG. (Minn. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 3, pp. 372–378, figs. 2).—Continuing the series previously noted (E. S. R., 83, p. 9), the

amylopectin content of wheat starch and wheat erythrogranulose was determined by the electrodecantation method. The phosphorus content of the starch and the various starch fractions were determined, as well as the susceptibility to α - and β -amylase hydrolysis. The results indicated that β -amylase action is not blocked, although perhaps retarded, by the phosphorus of the starch, and that the blocking of β -amylase action on a certain portion of the starch is apparently due to the structure of the carbohydrate in the residual erythrogranulose of the starch.

Protein films and the susceptibility of raw starch to diastatic attack, R. A. GOETNER and C. HAMALAINEN. (Minn. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 3, pp. 378-383).—The authors report upon experiments which show that when starch has been in contact with dilute sols of gelatin, gliadin, and egg albumen, and is subsequently treated with diastatic enzymes, there is a decrease in sugar produced which may amount to a large percentage. The data are discussed in the light of known protein behavior in forming protein films on inert surfaces, and it is suggested that the varying susceptibility of starch to diastatic attack is probably due to the presence of more or less incomplete protein films surrounding the starch granules, preventing the enzyme coming in direct contact with the starch surface.

The chemistry of lignin, I, II, A. J. BAILEY. (Minn. Expt. Sta.). (*Paper Trade Jour.*, 110 (1940), Nos. 1, pp. 29-34, figs. 4; 2, pp. 29-32, figs. 2; abs. in *Minnesota Sta. Rpt.* 1940, pp. 18-19).—These two papers report pulping experiments with aspen and pine in various butanol-water mixtures.

I. *The existence of a chemical bond between lignin and cellulose.*—Digestion of aspen and jack pine wood in butanol-water mixtures, buffered to prevent hydrolysis, removed all of the lignin from aspen and 80 percent of the lignin from jack pine. The remaining jack pine lignin was easily removed in the same solvent containing 2 percent NaOH. The lignin fractions appeared to be similar or identical, save that one was in chemical combination with cellulose, the other not combined. Yields under various conditions of digestion were determined, and changes in wood caused by digestion were followed by determining the analytical constants of the residues.

II. *The butanolysis of wood.*—Further studies in butanol pulping showed that 2 percent of alkali added to the butanol-water mixtures accelerated the delignification from 5 to 16 times. By using this type of liquor, almost white pulps containing only one-third of 1 percent of lignin were obtained in yields of from 43 to 50 percent, by cooking aspen for 15 min. and jack pine for 1 hr. Time-yield alkali-lignin content curves are shown for the entire practicable range for the pressure used. It is shown that the alkali functions chiefly as a catalyst in the lignin-butanol condensation rather than as a reactant. A theory of the mechanism of butanol pulping is offered and supporting experimental evidence pointed out. Butanol was easily recovered from the final liquor, 95 percent being recovered by separating the immiscible layer and several percent more by distilling 10 percent of the total liquor.

Diameter variation in cellulose fibrils, A. J. BAILEY and R. M. BROWN. (Univ. Minn.). (*Indus. and Engin. Chem.*, 32 (1940), No. 1, pp. 57-63, figs. 6).—Various plant fibers were disintegrated by mechanical means alone and by beating after different chemical treatments. Measurements of fibril diameters were made and analyzed statistically. The analysis showed that cellulose fibrils exist as uniform and true morphological units. Diameters of these fibrils are in the range of from 0.928μ to 0.956μ and are apparently independent of botanical origin, chemical treatment, or physical processing. The fact that cellulose fibrils fluctuate around a common average diameter, the amount of fluctuation being

essentially the same for various species and treatments, has far-reaching industrial significance. Two physical materials were found in all fibers—a compact, dense, unit fibril and a substance forming a hydrogel upon comminution in water. The unit fibril was incapable of gelatinization in water by ordinary methods. The disintegration of fibers into a gel and an inert fraction indicates that freeness and similar tests have only limited and empirical significance. The observed course of fiber disintegration explains many of the complex physical and chemical changes accompanying commercial beating. Unit fibrils from various sources are illustrated by photomicrographs.

Plasticity of doughs, O. E. STAMBERG and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 1, pp. 37–44, figs. 3).—A plastometer of the extrusion type, designed for use in the study of the plasticity of bread doughs, was so constructed that doughs maintained at a constant temperature were extruded through a 6-mm. aperture from a cylinder by means of air pressure equivalent to 500 mm. of mercury. Rate of flow per minute was used as an index of the relative plasticity of the doughs. It was found that small temperature variations may affect the rate of flow to a greater extent than any probable variations in pressure, thus emphasizing the necessity of precise temperature control in making such measurements. The logarithm of the rate of flow was a linear function of the proportion of water to flour used in mixing the dough. The apparatus may be useful in studying relative absorptions of flours and other dough ingredients.

Studies of the usefulness of a motor-driven sheeter in test baking, P. P. MERRITT, M. C. MARKLEY, and E. ROTHGOLZ. (Minn. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 3, pp. 384–387; abs. in *Minnesota Sta. Rpt.* 1940, p. 29).—A flour of medium strength was used to determine optimum settings for the rolls for each pass of the dough. Settings of $\frac{9}{32}$ in. for first pass and $\frac{3}{16}$ in. for second pass were selected. The motor-driven sheeter was found to reduce the variability in replicate bakes by individual operators but did not account for all of the variability encountered. The sheeter was found very useful as a time and labor saver. It should be fitted for at least two settings of the rolls and should be specified as official.

The effect of zinc on alkaline phosphatases, E. HOVE, C. A. ELVEHJEM, and E. B. HAER. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 425–442, figs. 6).—Because of disturbed nitrogen metabolism and decreased concentration of zinc in intestinal tissue and in bones of zinc-deficient rats, as noted in earlier studies (E. S. R., 81, p. 597), attention was directed to the possible effect of zinc ions on the activity of phosphatases from these and other tissues. In vitro tests, using various phosphate substrates, with crude or purified (dialyzed) phosphatase preparations in the presence of zinc ions at various concentrations indicated that crude intestinal phosphatase activity was increased from 40 to 100 percent by the addition of zinc ions, while crude kidney and bone phosphatase activities were progressively inhibited by concentrations of zinc of 4×10^{-3} to 70×10^{-3} mM. After dialysis, however, all three enzymes were markedly inhibited by zinc. Readdition of the dialyzate from intestinal phosphatase restored the ability of zinc to activate the dialyzed enzyme. Apparently the dialyzable zinc coactivator of intestinal phosphatase preparations was a product of mucosal tissue autolysis. Pure α -amino acids had the same coactivating property as the dialyzate, but β -amino, keto, hydroxy, or aliphatic acids, or organic amines had little or no activity. The ratio of concentrations of pure glycine to zinc ion was about 100:1 for maximum activation. The intestinal phosphatase of zinc-deficient rats was considerably lower than that of normal controls. These results are discussed in relation to disturbances in the nitrogen metabolism in zinc-deficient rats.

The relation of zinc to carbonic anhydrase, E. HOVE, O. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 136 (1940), No. 2, pp. 425-434, fig. 1).—The carbonic anhydrase was prepared from defibrinated beef blood, using the clear filtrate obtained after denaturing the hemoglobin of the lysed red cells with chloroform. In one series of experiments purification was effected by an acetone fractionation. The purest product was obtained, however, by treating 1 l. of the crude chloroform preparation with 10 cc. of saturated lead subacetate, dialyzing the filtrate for 2 days in the cold, and then partially purifying with alumina cream. Precipitation of the enzyme was effected with 2 volumes of chilled acetone. The precipitate was taken up in water, and the solution treated with alcohol (about 65 percent), the precipitate which formed being discarded. The dilute solution of the enzyme thus obtained had a zinc content of 0.318 percent on the dry basis and contained all of the zinc in the red blood cells.

The activity of the carbonic anhydrase, determined by a procedure outlined, was found to be inhibited by potassium thiocyanate. An equivalent amount of zinc was unable to neutralize this inhibitory effect of the thiocyanate, and even zinc ions alone in relatively large amounts produced 50-60 percent inhibition. Dithizone, the sensitive zinc reagent, produced little significant inhibition. Under the experimental conditions employed there was but little significant decrease in the carbonic anhydrase : hemoglobin ratio in zinc-deficient rats.

The formation of a vitamin B₂-borate complex, J. V. SCUDL, W. A. BASTEDO, and T. J. WEBB (*Jour. Biol. Chem.*, 136 (1940), No. 2, pp. 399-406, figs. 4).—Since borate buffer blocked the reaction of vitamin B₂ with quinone chloroimides to give the blue indophenol test, it appeared likely that the borate ion formed a complex with the vitamin in such a manner as to block its phenolic nature. In investigations to determine the nature of this complex, it was shown by various means that the boron atom is linked through the oxygen atoms in the 3 and 4 positions of the vitamin. Potentiometric titrations of mixtures of boric acid and the vitamin hydrochloride indicated that the vitamin-borate complex involves 2 molecules of the vitamin to 1 molecule of boric acid. This complex was found to be thermostable in neutral solution and to possess the physiological activity of vitamin B₂.

The constitution of vitamin K₂, S. B. BINKLEY, R. W. MCKEE, S. A. THAYER, and E. A. DOISY (*Jour. Biol. Chem.*, 133 (1940), No. 3, pp. 721-729).—Evidence is presented to show that the correct empirical formula for vitamin K₂ is C₂₈H₄₆O₂. On the basis of degradation products a structural formula is proposed, indicating the compound to be a 2,3-disubstituted 1,4-naphthoquinone with the substituent in the 2 position being a methyl group.

Determination of carotene in plant material: Dicalcium phosphate as an adsorbent, L. A. MOORE. (Mich. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 726-729, fig. 1).—The procedure described in detail "consists essentially of (1) extraction of the plant material with alcohol, (2) extraction of the alcohol with petroleum ether, (3) removal of the alcohol from the petroleum ether extract, and (4) filtration of the petroleum ether extract through a column of dicalcium phosphate to remove all colored substances other than carotene." Results by the present method were found to be in good agreement with those obtained by the method of W. J. Peterson, J. S. Hughes, and H. F. Freeman¹ where fresh material was analyzed. With plant material that had been stored or subjected to the digestive tract of the cow, the results by the latter method were the higher, due to the inclusion of carotenoidlike chromogens that

¹ *Indus. and Engin. Chem., Analyt. Ed.*, 9 (1937), No. 2, pp. 71-72.

had developed in the storage interval and that were retained by the petroleum ether phase even after washing with methyl alcohol. Biological assay of these noncarotenoid pigments derived from dehydrated alfalfa meal and separated chromatographically from the carotene showed them to contain approximately 1-2 percent of the carotene value of the sample. Transmission curves showed that there were about four of the noncarotene chromogens in the dried alfalfa used. The dicalcium phosphate, particularly when prepared by the method outlined, was found to cause no destruction of carotene during the filtering process.

The biological assay of riboflavin, M. F. CLARKE, M. LECHYCKA, and C. A. COOK (*Jour. Nutr.*, 20 (1940), No. 2, pp. 133-144, figs. 2).—Three materials widely used as the source of B complex factors free from riboflavin—extracts of rice polishings, whole wheat, and yeast—were compared in feeding tests with rats on a basal diet consisting of cornstarch 64, vitamin-free casein 20, hydrogenated cottonseed oil 10, salt mixture 4, and cod-liver oil 2 percent and supplemented after the depletion period with 48 μ g. of thiamin chloride.

The mean values for depletion time varied from 13 days on 150 mg. of the rice polish extract treated once with fuller's earth to adsorb traces of riboflavin to 34 days on 150 mg. of one of the yeast extracts. Growth on diets supplemented with riboflavin was significantly less with the wheat extract than with either the rice polish extract or the yeast extract, the results with which were similar. In view of the longer depletion time on the yeast extract the rice polish concentrate was selected as the most satisfactory supplement. This material was used in feeding tests in which riboflavin was given in graded doses of from 2.5 to 40 μ g. to groups of 10 rats (5 of each sex) for each dose, and equations for regression times relating the mean response, increase in weight in 4 weeks, to the logarithm of the dose were calculated. The curves, drawn separately for males and females, appeared to be linear up to the 20- μ g. dose, beyond which they tended to flatten out. The slopes of the curves were similar for the two sexes, although somewhat steeper for the males than for the females. In one experiment involving 130 rats, 80 percent of the negative controls, 24 percent of those receiving from 2.5 to 8 μ g. of riboflavin, and 5 percent of those receiving 10 μ g. of riboflavin had inflamed eyes or eyelids. Cures were not effected with large doses of a filtrate factor concentrate or vitamin A, but prompt improvement and complete cure in about 2 weeks followed daily doses of 40 μ g. of riboflavin. Only 4 cases of cataract were noted.

The application of the methods used in this study to the determination of the riboflavin content of various foods is discussed, with suggestions as to devices for decreasing the limits of error of the assay.

Determination of nicotinic acid in biological materials by means of photoelectric colorimetry, D. MELNICK and H. FIELD, JR. (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 1-16).—In the method described the cyanogen bromide-aniline reaction, as noted by Swaminathan (*E. S. R.*, 80, p. 131), is employed, but errors due to inadequate extraction or to adsorption are said to be avoided by direct acid hydrolysis of the test substance, followed by preferential charcoal adsorption for the decolorization of the hydrolyzate. A photoelectric colorimeter is used for the final color measurement. In analyses of biological solutions it is emphasized that a K value should be determined for each series of tests. The method is described in detail, and results are reported for the determination of nicotinic acid in various biological materials and the recovery from these same materials of added nicotinic acid.

The thromboplastin reagent for the determination of prothrombin, A. J. QUICK (*Science*, 92 (1940), No. 2379, pp. 113-114).—A thromboplastin satisfactory

for quantitative determination of prothrombin by the method of Quick² is prepared by macerating fresh rabbit brain, from which the pia has been stripped, in a glass mortar under acid-free acetone. The granular nonadhesive product obtained after several replacements of fresh acetone is dried on a small suction filter, and placed in 0.3-gm. amounts in glass ampoules which are evacuated and sealed. For use the material in one ampoule is mixed with 5 cc. of freshly prepared 0.85 percent sodium chloride solution, incubated for 15 min. at 50° C., and allowed to stand until the coarse material has settled. The milky supernatant liquid thus obtained, when used according to the technic of the Quick test, clots human plasma in from 11 to 12½ sec. and rabbit plasma in 6 sec. The dehydration of the fresh rabbit brain with acetone, or with dioxane, markedly increases the thromboplastic activity and stabilizes the product so that its activity is retained apparently indefinitely upon storage in an evacuated tube.

Studies on phenothiazine.—I, A Colorimetric method for estimation of phenothiazine, C. W. EDDY and F. DEEDS. (U. S. D. A.). (*Food Res.*, 2 (1937), No. 4, pp. 305-309, fig. 1).—In the colorimetric method developed for the quantitative estimation of this anthelmintic and insecticide, the conversion of phenothiazine to a highly colored red compound, believed to be 3,9-dihydroxyphenazothionium bromide, has been made the basis. The applicability of this method to the estimation of phenothiazine in apple spray residues has been demonstrated.

Determination of pyrethrins: A method for the quantitative determination of pyrethrins based on cleavage on hydrogenation, F. B. LaFORGE and F. ACREE, JR. (U. S. D. A.). (*Soap and Sanit. Chem.*, 17 (1941), No. 1, pp. 95-98, 115, fig. 1).

Removal of adhered rubber stoppers, A. J. BAILEY. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 1, p. 52, fig. 1).—The author describes a method for removing, quickly and easily, rubber stoppers adhering to bottles, tubing, and other glass or metal parts. Only a file is required, and the removal is less likely to cause breakage than are other methods.

AGRICULTURAL METEOROLOGY

Fair and warmer: The problem of weather forecasting and the work of the United States Weather Bureau, J. GAER (*New York: Harcourt, Brace & Co.*, [1939], pp. VIII+[3]+137, [pls. 15, figs. 4]).—This is one of a series of books related to the conservation of natural and human resources and is intended as a contribution to the social education of students in the high school years.

On climatological aids to local weather forecasting, H. LANDSBERG. (Pa. State Col.). (*Amer. Met. Soc. Bul.*, 22 (1941), No. 3, pp. 103-105, figs. 2).—Present-day weather forecasting is based almost exclusively on synoptic meteorological observations and weather maps. This address is a plea for the further use in local forecasting of the observations in a statistical fashion. This is where climatology—the summation of the single weather effects—enters the field of weather forecasting.

Insolation and the prediction of maximum temperatures, M. NEUBURGER (*Amer. Met. Soc. Bul.*, 22 (1941), No. 3, pp. 95-102, figs. 3).—"The amount of energy required to change the lapse rate of an atmospheric layer from one value to another is given by $Q = (\gamma_2 - \gamma_1) Q_1$ where $Q_1 = c_p \rho_m \frac{z_0^2}{2}$ is the energy required to change the layer of thickness z_0 and mean density ρ_m from isothermal

² Jour. Amer. Med. Assoc., 110 (1938), No. 20, pp. 1658-1662, fig. 1; 111 (1938), No. 19, p. 1775.

to dry adiabatic conditions. The height to which a given amount of effective insolation will establish an adiabatic lapse rate may be found by means of this formula, given the temperature-height curve in the early morning, and from this the expected maximum temperature may be evaluated. Of the total solar radiation received at the ground, some is reflected, some goes to heat the earth's surface, some is sent back as long-wave radiation, some is used in evaporation, and the remainder is effective in heating the lower layers of the atmosphere. Estimates are made of the amounts used in the first four ways. These amounts subtracted from the average insolation received on clear days leave the effective insolation for changing the lapse rate near the ground. The effective insolation at Chicago is arrived at in this way. Using these values, the maximum temperature was computed for several days when advective change was expected to be slight. The agreement with observation was found to be excellent."

Some possible relationships of planetary configuration and sunspots to world weather, C. A. MILLS (*Amer. Met. Soc. Bul.*, 22 (1941), No. 4, pp. 167-173, fig. 1).—"Earth temperatures tend to fall as Mercury and Venus in turn pass around on the opposite side of the sun, and to rise as each of these planets comes into the same heliocentric longitude as the earth. Sunspot maxima visible to the earth tend to occur more often when Mercury (the only planet studied in this respect) is on the opposite side of the sun, while sunspot minima are more frequent with Mercury on the same side as the earth. Earth temperatures show a pronounced tendency to be above normal during falling or low phases of the 11-yr. sunspot cycles, and to be subnormal in the rising or high phases of these cycles."

A report on the difference between the precipitation records as taken on the standard Canadian and United States rain-gauges, F. N. DENISON (*Amer. Met. Soc. Bul.*, 22 (1941), No. 2, pp. 65-67).—"Comparing rainfall observations as taken at Victoria College on the Canadian standard rain gage of 3.57-in. diameter and on the standard United States 8-in. gage, and a similar comparison at the Seattle Weather Bureau, the results appear to show that the small gage records more rainfall than the larger one, but the difference is less during windy weather, though no cause for it is at present given."

Interception and stemflow in a pine plantation, J. KITTEDGE, H. J. LOUGHEAD, and A. MAZURAK. (Univ. Calif. and U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 6, pp. 505-522, figs. 11).—"It is concluded from a 7-yr. study of interception and stemflow in a 28-year-old Canary Island pine plantation at Berkeley, Calif., that a storm classification based on total precipitation is more satisfactory than one based on rain intensity. A system using five storm classes (0-0.1, 0.11-0.3, 0.31-0.57, 0.58-1, and 1.01 in. or over) proved convenient. Stemflow usually commenced to add moisture to the ground when precipitation exceeded 0.2-0.25 in. The five storm classes averaged 0, 0.03, 0.31, 1.11, and 2.1 percent of precipitation as stemflow per storm, respectively. Though apparently not related to crown-length density, tree height, basal area, or crown area, stemflow tended to increase with excess or deficit of height of tree as compared to adjacent trees. Stemflow as high as 13 percent of precipitation was recorded in some class V storms. In storms of this class maximum constant stemflow percentage was approximately reached, but in inches depth it continued to increase with the amount of rain per storm. The total stemflow for plat areas was about 1 percent of the total precipitation. Interception varied under different parts of the crowns and in openings. The average interception-percent was highest on the leeward side of a tree and increased with wind velocity. On the windward side the minimum average interception-percent occurred beneath the crown periphery. It increased with wind velocity, but as the distance from

the stem decreased interception was less. It was usually highest near the stem and decreased with distance from the bole. The small openings between crowns showed interception. The average interception-percent for the stand was highest for light rains, decreasing steadily and assuming a nearly constant value in heavy storms. In inches depth the precipitation was small for light storms, increasing with increasing precipitation. Interception storage for the plantation was apparently 0.02-0.04 in., with an average of 0.03 in. As measured by trough gages up and down the slope close to the ground, interception corresponded to that derived from the rows of standard rain gages. The trees intercepted 17-28 percent of the season's precipitation, of which 1 percent was returned to the soil as stemflow.

Reports and papers, Western Interstate Snow-Survey Conference (Amer. Geophys. Union Trans., 21 (1940), pt. 1, pp. 95-144, figs. 16).—The following papers of interest to meteorology are included: Nevada Cooperative Snow-Surveys, Eastern Slope, Central Sierra Nevada—Comparison of Forecast and Actual Results, 1939, by H. P. Boardman, G. G. Devore, and L. Sanford (pp. 99-100) (Nev. Expt. Sta.); California Cooperative Snow-Surveys, Particularly Western Slope of Sierra Nevada—Report of 1939 Forecasts, by F. H. Paget (pp. 100-101); Los Angeles Department of Water and Power—Summary of 1939 Forecast for Owens Basin, California, by J. E. Jones (p. 101); Accuracy of Forecasts at Huntington, Florence, and Shaver Lakes, by W. A. Lang (p. 102); Utah Cooperative Snow-Surveys—Comparison of Forecasts and Runoff for 1939 for State of Utah, by G. D. Clyde (p. 103) (Utah Sta.); South Continental Divide—Comparison of Forecasts and Runoff in the Platte, Arkansas, Rio Grande, and Colorado Basins for 1939, by R. L. Parshall (pp. 103-104) (Colo. Sta. and U. S. D. A.); Forecast of Inflow of Colorado River Into Lake Mead at Boulder Dam, 1939, by E. B. Deblor (p. 104); North Continental Divide—Comparison of Forecast and Runoff of the Upper Missouri Basin at Fort Peck Reservoir, 1939, by D. B. Freeman (pp. 104-105); British Columbia Snow-Surveys—Report on Snow Surveys and Actual Runoff in the Upper Columbia, Fraser, and Powell River Basins for 1939, by R. C. Farrow (pp. 105-108); Forms for Recording and Reporting Measurements, by R. L. Parshall (pp. 109-119); Soil-Moisture With Reference to Runoff, by G. D. Clyde (p. 119) (Utah State Agr. Col.); A Quantitative Forecast-System of Runoff Based on Snow-Surveys at the Mean Elevation of the Snow-Cover in the Merrimack Basin, by J. V. Salo (pp. 119-120); and Some Factors Affecting Frost-Penetration—A Summary, by H. B. Atkinson and C. El. Bay (p. 121) (El. S. R., 85, p. 159), Progress-Report on Mountain Snowfall-Program of the Weather Bureau, by M. Bernard and A. R. Codd (pp. 122-130), and Problems of the Division of Irrigation in Forecasting Water-Supplies, by W. W. McLaughlin (pp. 131-133) (all U. S. D. A.).

Snowdrifts as a factor in growth and longevity of shelterbelts in the Great Plains, J. H. STORCKELEY and E. J. DOETIGERAC. (U. S. D. A. and Univ. Minn.). (Ecology, 22 (1941), No. 2, pp. 117-124, figs. 5).—Shelterbelts with one or more dense shrub rows at least 8 ft. high were very effective in trapping snow in drifts 5-8 ft. or more deep. The snow was practically all stopped in a zone 30-80 ft. wide on the lee side of the first shrub row encountered by the wind. Narrow belts of tall trees devoid of limbs near the ground allowed the snow to sweep under the belt and deposit in a thin sheet on the lee side in a zone extending 600-1,200 ft. beyond the belt. Where shelterbelts were so designed as to cause deep snowdrifts, the increase in soil moisture from fall to spring was equivalent to 10 in. of water, and the crop areas within 80 ft. of the belt showed an increase of 5 in. due largely to lateral movement from melting drifts. The great increment to soil moisture due to

water from melting snow is suggested as partially explaining why shelter-belts in the northern plains often maintain themselves in vigorous condition for as long as 50 yr., whereas in the southern plains, in a zone of apparently equal precipitation, the tree belts on fine-texture soils may survive only 20-30 yr. Where snow cover was over 3 ft. deep the frost depth in tree belts was as little as 0-4 in., whereas in nearby fields with less than 1 ft. of snow the frost was 12-18 in. deep on March 1. In midwinter frost depth in open fields was at least 2-3 ft.

Ring growth in three species of conifers in central Washington, H. P. HANSEN. (Oreg. State Col.). (*Ecology*, 22 (1941), No. 2, pp. 168-174, fig. 1).—A study of radial growth in western yellow pine, western larch, and Douglas fir near the lower edge of the arid transition (timbered) zone revealed a limited annual ring growth. In correlating ring growth with precipitation for 36 yr., Douglas fir responded positively most often and yellow pine least so. There was little difference in degree of correlation with annual, March-August, and a modified annual precipitation curve. Limited ring growth indicates that the physical environmental factors are neither at an optimum nor in adjustment with one another. The low summer rainfall and the high temperature seem to be dominant opposing factors preventing normal growth.

Some propositions in tree-ring analysis, E. SCHULMAN. (Univ. Ariz.). (*Ecology*, 22 (1941), No. 2, pp. 193-195).—In this address a general outline is presented of the principles and results of work based on precision dating of rings as developed by Douglass (E. S. R., 78, p. 158) in order to provide a "frame of reference" for papers on detailed special cases.

The origin of atmospheric oxygen, R. L. NICHOLS (*Amer. Met. Soc. Bul.*, 22 (1941), No. 4, pp. 149-151).—Several theories of the origin of O_2 in the atmosphere are discussed.

Fluctuations of atmospheric sulphur dioxide, W. J. YODEN (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 473-484, figs. 3).—"Examination of a continuous record of the sulfur dioxide concentration in the atmosphere [at Yonkers, N. Y.] shows a daily cycle which changes form with the seasons. In the winter months the concentration builds up during the day and falls off in the evening. In other seasons the drop occurs in the early afternoon and is probably the result of northerly breezes at that time of day. There is a weekly cycle, found at all seasons, in which the concentration is low on Sunday and Monday and increases by about 50 percent to a maximum on Thursday and Friday. The annual cycle follows a sine-shaped curve with a minimum of 15 parts of SO_2 per thousand million of air in the summer to a maximum of 50 in the winter. The influence of the weather was brought out by deriving regression equations which show a strong correlation of sulfur dioxide concentration with wind direction and velocity, temperature, and to some extent with rainfall."

[Meteorological data for Florida] (Florida Sta. Rpt. 1940, pp. 132-144, 167-169, 189-190, 198, fig. 1).—A report of the Federal-State Horticultural Protection Service is given, including data on the 1939-40 winter season, recorded as the coldest since the "big" freeze of 1895, accuracy of forecasts, warnings of the 1940 freeze, and savings due to these warnings (tabulated). Also included are meteorological records at the Everglades Substation (June 1939-May 1940) and the North Florida Substation (July 1939-June 1940) and data from the Subtropical Substation on the freeze of January 23-30, 1940.

Meteorological observations (Maine Sta. Bul. 400 (1940), pp. 287-291).—Tabulated meteorological summaries for Orono and Presque Isle (1939 and January-June 1940) and rainfall records for Highmoor Farm (May-October 1940) are presented.

Monthly Weather Review, [January–February 1941] (*U. S. Mo. Weather Rev.*, 69 (1941), Nos. 1, pp. 31, pls. 12, figs. 6; 2, pp. 33–69, pls. 13, figs. 14).—In addition to meteorological, climatological, solar radiation, and sunspot data, the following papers are included:

No. 1.—A Heat Radiation Telescope and the Measurement of the Infrared Emission of the Atmosphere, by W. M. Elsasser (pp. 1–5); and The Variability of Precipitation [Discussed From a Statistical Standpoint], by V. Conrad (pp. 5–11).

No. 2.—On the Interpretation of Temperature Measurements Made at High Levels, by J. C. Ballard (pp. 33–40); The Dual Rainfall Regime of Roswell, New Mexico, by P. R. Crowe (pp. 40–47); Preliminary Report on Tornadoes in the United States During 1940, by J. P. Kohler (pp. 47–49); and The Weather of 1940 in the United States, by W. W. Reed (pp. 49–51).

SOILS—FERTILIZERS

Integrating soil and crop research, R. M. SALTER. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 3, pp. 237–245).—This is a discussion paper of the need and opportunity for the correlated application of both soil and crop information in the study of soil and crop problems. Investigations intended to give information on soil and plant interactions must take into account that the crop produced represents the integrated effect of a whole series of interacting and fluctuating influences and processes. Several examples are presented wherein the cooperative attack on soil and plant problems has been especially worth while.

[Soil investigations by the Arizona Station]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1940*, pp. 9, 10–12, 15, 16, 18, 19–20).—Progress in soil-science research is reported on the soil changes which accompany water spreading; influence of organic-matter decomposition on the physical and chemical properties of some Arizona soils; oxidation-reduction potentials of semiarid soils; moisture relations in puddled soils; development of a capacitance bridge or soil-moisture meter; development of acidulated fertilizers through the use of a small amount of sulfur; a method for determining soil pH; and improved soil practices for cotton.

[Soil investigations by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1940*, pp. 102–103, 122–131, 148–152, 170–171, 172–173, figs. 3).—Progress in soil research is reported on the following subjects: Rapid soil tests in relation to response of lettuce and tomatoes and fertilizer recommendations, trace-element requirements and deficiency symptoms of vegetable crops, and comparative efficiency and economy of different nitrogenous fertilizer materials on tomatoes on sandy soils, all by J. R. Beckenbach and D. G. A. Kelbert; soil and plant relationships for determining the cobalt requirements of cattle, by J. R. Henderson, G. M. Volk, and L. H. Rogers; study of plant materials for the presence of unusual elements, by Rogers and R. A. Carrigan; the development and evaluation of physical and chemical methods of complete and partial analysis for soils and related materials, by Rogers, Carrigan, and Volk; study of the so-called quick methods for determining soil fertility, by Volk, C. E. Bell, and H. W. Winsor; types and distribution of micro-organisms in Florida soils, metabolism and functional relationships of strains of *Alcaligenes (Bacillus) radiobacter* and the decomposition of organic matter and its effect on the soil, all by F. B. Smith; methods of inoculating legumes in Florida soils, by Smith and R. E. Blaser; a study of soils in relation to yield and quality of pasture grasses, clover, and bright tobacco, by Volk and Bell; effect of type and treatment of Florida soils on the yield, composition, and quality of potatoes and other

crops, by Volk and Winsor; and effect of type and treatment of Florida soils on the composition and quality of citrus, by R. V. Allison and Volk.

From the Citrus Substation are reported rapid micromethods for soil analysis, effects of basic materials on soil pH, and a study of soil reaction within and outside the area of tree spread, all by M. Peech.

At the Everglades Substation, soil fertility investigations under field and greenhouse conditions with grasses, field crops, and citrus are reported by J. R. Neller, W. T. Forsee, and F. T. Boyd; and losses by oxidation as determined by lysimeters and analytical methods and the effect of green manuring, by Neller and Forsee.

[Soil Survey Reports, 1933, 1935, and 1936 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1933, No. 36, pp. 43, figs. 3, map 1; 1935, Nos. 15, pp. 44, figs. 2, map 1; 18, pp. 85, figs. 4, map 1; 19, pp. 52, figs. 2, map 1; 1936, No. 7, pp. 94, pls. 2, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1933, No. 36, Ingham County, Mich., J. O. Veatch et al.; 1935, Nos. 15, Pine County, Minn., C. S. Simmons et al., 18, Sumter County, Ala., G. A. Swenson et al. (Ala. Dept. Agr. and Indus.), and 19, Clay County, N. C., S. O. Perkins et al.; and 1936, No. 7, the Casa Grande area, Ariz., E. N. Poulson et al.

The work of the Soil Conservation Service, M. M. TOZIER (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, pp. [2]+12, pl. 1, figs. 5*).—The role of the Soil Conservation Service in the Nation-wide program of soil-erosion control is discussed. The development of the program on soil conservation through the medium of districts represents one of the major accomplishments in bringing about better use of the land. The objectives and need for the following projects are reviewed: Demonstration, grassland, scattered settler, forestry, pasture, drainage of land, and highway.

Soils and security, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, pp. [2]+25, figs. 14*).—The general cause and effects of erosion in various sections of the world and the United States are discussed. The cost of erosion as measured by silting, flooding, and water supplies represents an important economic problem. The program of the Soil Conservation Service in relation to bringing about better practices, land use, and erosion control is reviewed.

Wind erosion of soils in relation to size and nature of the exposed area, W. S. CHEPIL and R. A. MILNE (*Sci. Agr., 21 (1941), No. 8, pp. 479-487, figs. 2*).—Investigations are reported on the relations between wind velocity, intensity of soil drifting, and area and nature of the eroding surface. Over bare-fallow fields the intensity of wind erosion increased with distance in some cases to as far as 450 yd. from the windward edge. Increase in intensity of soil drifting with distance is not altogether due to the diminishing sheltering effect of the adjacent noneroding areas but mainly to the cumulative effect of soil drifting. Thus the principal value of strip cropping seems to be in its use as a barrier which traps the moving soil and decreases the cumulative intensity of soil drifting.

Relation of wind erosion to the dry aggregate structure of a soil, W. S. CHEPIL (*Sci. Agr., 21 (1941), No. 8, pp. 488-507, figs. 10*).—Results are reported on the relation between the wind erosiveness of soils and their dry aggregate structure. A return flow type wind tunnel in which velocities up to 37 miles per hour at 6-in. height could be produced was used for these studies. Mathematical equations were formulated by which the erosiveness of any uniform mixture of soil aggregates may be evaluated. Equations based on the dry-sieving analysis of the soil seemed to afford an approximate measure of the susceptibility of freshly cultivated and uniformly mixed dry soils to wind erosion, but not of soils that have been left untilled for some time. The dry aggregate

structure, as determined by dry-sieving analysis, cannot be regarded as a single criterion by which the inherent erosiveness of soils may be determined.

Influence of Colorado River silt on some properties of Yuma mesa sandy soil. W. T. McGEORGE (*Arizona Sta. Tech. Bul.* 91 (1941), pp. [2]+197-217, figs. 11).—Mixtures of air-dried Superstition sand and river-bed silt were prepared and analyzed for settling volume, apparent specific gravity, pore space, water-holding capacity, moisture equivalent, percolation rate, and rate of capillary water movement. Results indicate that both structurally and texturally Superstition sand can be improved by incorporating Colorado River silt. It is suggested that some provision should be made to supply silty water to the sandy mesa lands for irrigation and that it should be supplied over a long enough period to add from 15 to 20 percent for an 18-in. depth of sandy soil. The river silt also adds a sizable supply of available potassium, calcium, and phosphate to the sandy soils.

Better harvests through conservation farming. R. E. UHLAND. (Coop. Tex., N. Mex., Okla., and Kans. Expt. Stas.). (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, pp. [2]+10, figs. 6).—The effect of moisture conserved in regions of low rainfall by various soil conservation practices on crop yields is presented as to cotton in the Texas Panhandle, beans in a mountain valley in New Mexico, wheat in the southern Great Plains, and grain sorghums in the High Plains of Texas.

Soil moisture studies, II, III. J. C. WILCOX and R. H. SPILSBURY (*Sci. Agr.*, 21 (1941), No. 8, pp. 459-472, figs. 5; pp. 473-478).—Further work in this series (*El. S. R.*, 83, p. 454) is noted.

II. Some relationships between moisture measurements and mechanical analysis.—With an increase in the colloidal content of the soil, the wilting coefficient at first increased less rapidly than the field capacity, with a resulting increase in the available moisture, but above 60 percent colloid they increased at about the same rate, resulting in a leveling off of the available moisture content. Mechanical analysis and settling volume were found to be satisfactory in determining the field capacity and wilting coefficient.

III. An application of soil moisture measurements to soils classification.—The authors suggest that the usual soil-survey data could be supplemented by a classification based on soil-moisture values. The use of the field capacity is recommended.

Experiences in the use of the electrical resistance method of Bouyoucos and Mick in measuring soil moisture under field conditions. N. L. PARTIDGE. (*Mich. State Col.*). (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 120-123, fig. 1).—Field studies on the use of the electrical resistance method (*El. S. R.*, 83, p. 307) for determining soil-moisture conditions under shade trees are considered.

The use of the wilting coefficient in soil moisture studies in southwestern Saskatchewan. W. J. STAPLE and J. J. LEHANE (*Sci. Agr.*, 21 (1941), No. 8, pp. 440-447, fig. 1).—Results are reported on soils from various locations. Readily available moisture based on directly determined wilting percentages gave a satisfactory basis for soil moisture studies. The moisture equivalent method was considered the quickest and most accurate.

Soil organic matter. F. S. PRINCE. (*Univ. N. H.*). (*Amer. Fert.*, 94 (1941), No. 9, pp. 5-8, 24, 26).—Soil organic matter is considered as to its source of origin and chemical nature. The effects of climate, cropping practices, soil management, and fertilizers on organic matter are considered.

The rate of decomposition of plant roots. J. L. DOUGHTY (*Sci. Agr.*, 21 (1941), No. 8, pp. 429-432).—Considerable variation was found in the rate of

decomposition of the crown and roots of the plants studied, those of thread-leaved sedge being the most resistant of the plant materials used. Rate of decomposition was comparable to the carbon:nitrogen ratio, being more rapid in the material with the narrower ratio.

Bacteriostatic and bactericidal substances produced by a soil Actinomyces, S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 609-614).—A species of *Actinomyces* was isolated from the soil which has marked bacteriostatic and bactericidal effects upon the bacteria belonging both to the Gram-positive and Gram-negative types. The bacteriostatic and bactericidal substance was shown to consist of two compounds, designated as "actinomycin A" and "actinomycin B." Actinomycin A was found to be highly bacteriostatic, inhibiting many Gram-positive bacteria by dilutions of 1:100,000,000, while the Gram-negative bacteria were inhibited only by higher concentrations, namely, from 1:5,000 to 1:100,000. Actinomycin B was found to be weakly bacteriostatic, but more actively bactericidal.

Physiologic studies of *Rhizobium meliloti*, with special reference to the effectiveness of strains isolated in Kansas, J. T. KROULIK and P. L. GAINES. (Kans. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 6, pp. 359-369, figs. 2).—Two hundred and seventeen cultures of *Rhizobia* were isolated from alfalfa and sweetclover in the vicinity of Manhattan and their nodule-forming, nitrogen-fixing, and growth-stimulating abilities measured quantitatively. A comparison of the number of nodules formed with the quantities of nitrogen fixed by the 217 cultures revealed a significant negative correlation between these two characteristics. It is indicated that only when the number of nodules formed is relatively high, that is, more than from 12.5 to 15 per plant in the reported tests, does high nodulation become incompatible with efficient nitrogen fixation. Results with two separate good strains gave a positive correlation between nodulation and nitrogen fixation, but in no case did nodulation attain the minimum suggested as being associated with inefficient nitrogen fixation.

A soil fertility survey by rapid chemical tests, F. F. MORWICK and C. P. RIVAZ (*Sci. Agr.*, 21 (1941), No. 8, pp. 433-439, fig. 1).—The methods used for obtaining a soil fertility survey of York County, Ontario, Canada, are presented. Approximately 2,000 samples were collected by farmers and forwarded to a central laboratory for analysis. Rapid chemical tests were used in determining water-soluble calcium, water-soluble magnesium, dilute acid-soluble phosphorus, replaceable potassium, and active organic matter.

Proceedings of the sixteenth annual meeting of the National Joint Committee on Fertilizer Application, including reports of cooperators, held at Chicago, Illinois, December 2, 1940 (*Natl. Joint Com. Fert. Appl. Proc.*, 16 (1940), pp. [2]+156, figs. 48).—Reports of special regional committees concerned with the fertilizer-placement program, including research, extension, and adaptation of improved methods to farm practice, are given.

Fertilizers for Utah soils, D. W. PITTMAN and D. W. THORNE (*Utah Sta. Cir.* 116 (1941), pp. 20, figs. 2).—General plant nutrients and fertilizers supplying the various nutrients are discussed, along with fertilizer experiment trials with miscellaneous crops and pastures.

Use of liquid fertilizers for growing vegetables, V. A. TIEDJENS. (N. J. Expt. Stas.). (*Amer. Fert.*, 94 (1941), No. 9, pp. 9-10, 22).—It is indicated that liquid fertilizers cannot be applied in the same way to all vegetable crops. The preparation and use of starter solutions and solutions for transplanting and for side dressing are discussed. Suggested equipment for applying the liquid fertilizers is considered.

The nutrition of muck crops, P. M. HAMMER. (Mich. State Col.). (*Better Crops With Plant Food*, 25 (1941), Nos. 3, pp. 19-22, 38-42, figs. 4; 4, pp. 12-16,

44-46, figs. 7).—General fertilizer practices for various crops are discussed. The importance of potash fertilization on muck soils is emphasized. If potash is supplied from a mineral fertilizer, the use of barnyard manure is not necessary. Fertilizer recommendations for muck soils are given for various crops on different types of muck. The relation of soil reaction to response from sulfur and manganese sulfate is indicated by yield records for potatoes. It is pointed out by the author that the relation of proper fertilizer materials is of extreme importance on muck land, but that fertilizers alone cannot overcome the effects of drought or poor drainage.

Utilization of barnyard manure for Washington soils, L. E. DUNN and L. C. WHEETING (*Washington Sta. Bul. 395 (1941), pp. 20*).—Results are reported for 43 experiments conducted to ascertain the benefits that may be derived from reinforcing farm manure with nitrogen and phosphate fertilizers and to compare returns from different rates of manure application. The test included oats, barley, corn, mixed grasses, red clover, alfalfa, sugar beets, and potatoes. A general discussion of fertilizer needs is presented.

Both nitrogen and phosphate fertilizers were found to be used to good advantage to reinforce average farm manure from horses, cattle, sheep, and hogs for use on Washington soils. When the manure was reinforced with nitrogen alone western Washington soils gave slightly larger crop responses than when it was reinforced with phosphate alone. On the irrigated soils in eastern Washington the response was greater with manure reinforced with phosphate alone. It was found to be more profitable to use lighter applications of manure reinforced with nitrogen or phosphate fertilizer or both than to use heavier applications without reinforcement. Two hundred and fifty lb. of 20 percent superphosphate may be used as the phosphate reinforcement for a 6-ton application of manure, while 100 lb. of sulfate of ammonia or 125 lb. of nitrate of soda will supply the nitrogen reinforcement. Treble superphosphate may be used at the rate of 120 lb. to supply the phosphate, or both the nitrogen and phosphate reinforcements may be supplied by approximately 150 lb. of ammonium phosphate.

The conservation of ammonia in manure (*Maine Sta. Bul. 400 (1940), pp. 215-217*).—Investigations by E. R. Tobey, B. E. Plummer, Jr., and D. S. Fink are noted on absorption in bedding materials with and without the addition of 20 and 47 percent superphosphate, gypsum, various acids, etc.

The penetration and availability of metaphosphates in soils, G. M. GILLIGAN (*Delaware Sta. Bul. 229 (1941), pp. [1]+16, fig. 1*).—Results are reported on the penetrating power and subsequent availability of calcium and potassium metaphosphates compared with superphosphate and triple superphosphate on Chester loam, Sassafras silt loam, and Sassafras sand. The effect of wetting and drying upon the availability of phosphorus is also considered. On the Chester loam and Sassafras silt loam very little movement of phosphorus occurred beyond a 3-in. depth, but on the Sassafras sand the penetration of phosphorus extended throughout an entire 12-in. column. Superphosphates in general exceeded the metaphosphates in mobility, with availability following a similar trend. The potassium of potassium metaphosphate was more mobile than the phosphorus. Phosphate fixation was greater in soils treated with metaphosphate than in soils receiving superphosphate.

A new explanation of what happens to superphosphate in limed soils, W. H. MACINTIRE (*Tennessee Sta. Bul. 176 (1941), pp. 16*).—This explanation is based on 14 yr. of study on chemical transitions and solubility changes that have taken place when superphosphates were mixed with calcic, magnesian, and dolomitic liming materials, both before and after incorporation with the soils. The role of fluorine in phosphate availability is discussed. It is indicated that

dicalcium and tricalcium phosphates, as well as phosphates of magnesium, are readily available to plants, whereas calcium fluorophosphate is not. Thus the conversion of the water-soluble phosphates of superphosphate to dicalcium phosphate, and on to tricalcium phosphate in the soil, probably would not mean a serious loss of available phosphorus, provided the soil content of calcium carbonate was not sufficient to exert a repressive effect upon the solubility of other soil nutrients. The opinion expressed by the author on what becomes of superphosphate when drilled into the soil is as follows: When premixtures of superphosphate and wetted limestone or dolomite are cured and incorporated in the soil, or when superphosphate is incorporated in a prelimed or calcareous soil, the water-soluble phosphates pass to dicalcium phosphate, tricalcium phosphate, and calcium fluorophosphate, the calcium fluorophosphate being lowest in availability. The need for further work on the effect of additive fluorides on the availability of P₂O₅ within the soil and upon the content of fluorine of various crops and for lysimeter experiments to determine the removal of fluorides from the soil is indicated.

Available potassium in Alabama soils, N. J. VOLK. (Ala. Expt. Sta.). (*Better Crops With Plant Food*, 25 (1941), No. 4, pp. 6-8, 38-42, figs. 2).—Analyses of soils from Alabama and from Wisconsin are compared to show the difference in total potassium content for soils considered old and young geologically. The Alabama soils had left only about from one-tenth to one-fifth as much potassium as the Wisconsin soils, but it is indicated that Alabama soils are able to rebuild the content of replaceable potassium through the release of potassium from the nonreplaceable form. Greenhouse experiments with 10 soils showed that roughly 75 percent of the potassium removed from the soils in 1 yr. came from the nonexchangeable form. The results of cooperative field tests are also reported. It is suggested that the loss of potassium from leaching can be greatly reduced in the South through the use of winter legumes.

Pasture studies.—XVIII, The availability, utilization, and fixation of potassium applied to permanent pastures, C. L. WRENSHALL and L. S. MARCELLO (*Sci. Agr.*, 21 (1941), No. 8, pp. 448-458).—Continuing earlier work (E. S. R., 79, p. 19), potash fertilization increased the yield of pasturage and also the potash removed from the soil by increasing the potash content of the plant. Available potash in the top 3-in. layer was increased by top dressing with muriate of potash. Where superphosphate was applied with the potash treatment the amount of available potash found in the soil was less than where potash was applied alone. A greater uptake of potash from the phosphate-treated plats, due to increased yields, accounted for part of the decrease in available potash. It is also concluded that soluble phosphate promotes the fixation of potash in unavailable form.

Synthetic wood ashes require boron, A. R. MIDGLEY and R. E. DUNKLEE (Vt. Expt. Sta.). (*Better Crops With Plant Food*, 25 (1941), No. 5, pp. 6-9, 42-44, figs. 5).—The beneficial action of wood ashes for pasture and alfalfa production is considered. The greater response of alfalfa to wood ashes over that obtained from equivalent amounts of lime, superphosphate, and potash is ascribed to the greater boron content of the ashes. The use of boron is considered essential for the success of many crops. It is suggested that chemical fertilizers made for use in Vermont, northeastern New York, and probably other New England States be enriched with small amounts of borax.

AGRICULTURAL BOTANY

[Abstracts of papers] (*Amer. Chem. Soc. Mtg.*, 101 (1941), *Abstr. Papers*, pp. 6A-7A, 21A-22A, 4C-5C, 7C).—The following are of botanical interest: Analysis of Plant Extracts for Chlorophylls *a* and *b* by a Spectro-photoelectric Method, by

C. L. Comar and F. P. Zscheile, Jr. (p. 6A) ; The Chloroplast Substance of Spinach Leaves, by C. L. Comar (pp. 6A-7A) (Ind. Expt. Sta.) ; Influencing Plant Development With Leaf Extracts and Other Organic Substances, by C. G. Vinson, A. D. Hibbard, and R. Rodney (p. 21A) (Univ. Mo.) ; The Comparative Boron Content of Potato Leaves and Tubers Produced Under Different Cultural Conditions, by R. B. Carson, W. E. Tottingham, and R. MacVicar (p. 22A) (Univ. Wis.) ; Shrinkage and Cell Wall Structure of Cotton Fibers, by E. E. Berkley (pp. 4C-5C) (U. S. D. A.) ; and Formation of Cellulose Crystallites in Plastids of Living Plant Cells, by W. K. Farr (p. 7C).

Bibliography of botanical works contained in "Memoires et Comptes rendus de la Société Royale du Canada" from 1882 to 1936, inclusive [trans. title], J. ROUSSEAU, M. GAUVREAU, and C. MORIN (*Univ. Montréal, Contrib. Inst. Bot.*, 33 (1939), pp. 117).—This bibliography is alphabetical by authors, and analytical and alphabetical indexes to the subject matter are provided.

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, October 1 to December 31, 1936 (*U. S. Dept. Agr., Inventory 129* (1941), pp. 32).—This number lists 856 lots of plant material with descriptive notes in many cases.

Botanical science helps to develop a new relief for human suffering, C. L. HOEN. (P. R. Expt. Sta.). (*Jour. N. Y. Bot. Gard.*, 42 (1941), No. 496, Sect. 1, pp. 88-92, figs. 3).—A brief account on the value of the curative properties of Barbados aloes (*Aloe vulgaris*) for burns of various types, including those due to X-rays and radium, and on work by the station showing that the plant can be grown in Puerto Rico and shipped long distances with retention of its curative properties.

The significance of bacterial spore antigens in taxonomy, C. LAMANNA. (Wash. State Col.). (*Northwest Sci.*, 15 (1941), No. 2, pp. 47-49).—A discussion of the applications of serology to taxonomy in general and of the implications arising from the facts that specific spore antigens exist, that they often have taxonomic significance, and that they may have possibilities in differentiating and identifying organisms.

Seed impressions on plastic films, T. M. PLITT (*Plant Physiol.*, 16 (1941), No. 2, pp. 422-424, fig. 1).—Microscopic details on the hard surfaces of seeds or other parts of fruits are often sufficiently characteristic for identification. The method presented is a modification of one recently developed by Hardy and Plitt for making impressions of fur-fiber surface structures (see p. 639) and is applicable in taxonomic studies, in determining certain foods and drugs, and in identifying seeds and fruits in food-habit studies. The method is rapid, and many impressions may be made on one set of films.

Further studies on the rapid determination of the germinative capacity of seeds, F. FLEMION (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 455-464).—Previous determinations (E. S. R., 80, p. 173) of the germinative capacities of seeds based on the behavior of excised embryos are extended to include 24 additional species in 11 families. Agreement between the germinability obtained by this method and actual germination tests following the proper after-ripening procedures was close. The method is therefore applicable for a rapid determination of the germinability of seeds which by ordinary methods would require impractically long periods. Any difficulty in the method occurs in connection with excision of the embryos. However, the present study has shown that various types of pretreatment such as acid treatment, cracking of outer coats, short period in moist peat moss, partial afterripening of the embryos, etc., will usually overcome this difficulty in any particular seed.

Physiological phases of plant nutrition (*Florida Sta. Rpt. 1940, pp. 185-186*).—Brief reports on a survey study by F. S. Andrews and J. R. Neller of the influence of depth of water table on yields of celery, beans, and potatoes; and on analyses of pasture grasses for P content.

Use of Lemna for nutrition studies on green plants, R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 7, pp. 423-430*).—Growing *L. minor* aseptically in pyrex flasks illuminated by tungsten lamps, fluorescent lamps, or north light, deficiencies in Fe, Mn, and Ca were found to exist in nutrient solutions prepared with reagent chemicals. Use of the CaCO₃ method of nutrient-solution purification led to a definite intensification of these effects. Additions of Fe, Zn, Mn, Mo, Ga, and B were found necessary after purification. The conditions essential to the method as employed with green plants were established, and its use is suggested in studies of trace-element requirements in crop plants.

Studies in the physiology of Fusaria: The respiratory and fermentative mechanisms, B. S. GOULD and A. A. TYTELL (*Jour. Gen. Physiol., 24 (1941), No. 5, pp. 655-667*).—*Fusarium trichothecioides* was selected for an investigation of the respiratory and fermentative activities of Fusaria, "resting-cell" suspensions being studied by the Barcroft manometric technic. The results indicate clearly that the mechanism of respiration is distinct from that of fermentation. Anaerobically no significant CO₂ production was apparent without added substrate. In the presence of glucose, the anaerobic CO₂ evolution was practically equal to the added CO₂ evolved aerobically in the presence of added glucose. Low concentrations of iodoacetate or fluoride selectively poisoned the exogenous but did not affect the endogenous mechanism. Alcohol is not produced in the course of the latter (respiration), but is produced in the presence of added glucose. A study of the metabolism of the organism throughout its entire growth phase from 1 to 7 days was made. The ability of suspensions of a *Fusarium* species, obtained by growth on a variety of common substrates, to attack a large number of C sources with the production of exogenous CO₂ was determined. It was found that organisms grown on glucose attack only glucose, mannose, and fructose, but none of the common intermediary metabolites except pyruvic acid. Organisms grown on galactose attacked galactose, as well as the other hexoses, indicating an adaptive mechanism. An identical mechanism for the dissimilation of glucose, mannose, and galactose is indicated. Growths on nonhexose C sources attacked glucose slightly under the experimental conditions, with evolution of CO₂, but did not attack any other substrate tried. This would indicate a residual glucose-dissimilating mechanism in all growths investigated. Striking similarities between the general metabolism of resting suspensions of the *Fusarium* used and resting suspensions of yeast cells were apparent.

A method for the continuous measurement of transpiration of single leaves under natural conditions, J. GLOVER (*Ann. Bot. [London], n. ser., 5 (1941), No. 17, pp. 25-34, figs. 9*).—The apparatus described enables the obtaining of data under approximately normal environal conditions. Illustrations of its application to studies of the march of transpiration in *Coffea arabica* and in the wilting of a corn leaf are given. It measures with wet and dry constantan-copper thermocouples the amount of moisture added to a stream of air of known velocity applied to and removed from a transpiring leaf surface by means of a transparent cup sealed to it. The saturation deficit of the outgoing air stream is compared with that of the incoming stream and the transpiration rate determined.

Studies of the physiology of Coffea arabica.—III, Transpiration rates of whole trees in relation to natural environmental conditions, F. J. NUTMAN

(*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 59-81, figs. 9).—A method is described for determining transpiration rates of large plants over short intervals, results being presented for *C. arabica* in three environments, together with accompanying climatic factors. Rapid and considerable short-period fluctuations in transpiration rates are described and illustrated, and evidence is presented for their reality. The details of the daily march of transpiration, recorded over 5-min. intervals, are shown to be due almost entirely to variations in incident radiation, especially when moderate or low. During periods of high radiation the correlation is reduced, sometimes to insignificance. This is ascribed to the effects of stomatal movements. The hourly average transpiration rate is also mainly determined by radiation, although other factors play a subsidiary role, especially when radiation is moderate or low. The daily transpiration rate is shown to be determined both by radiation and by saturation deficit, and to be independent of temperature. These results are discussed in relation to those of Briggs and Schantz (*El. S. R.*, 34, p. 522; 36, p. 225), and it is suggested that the deductions made by these authors from their records are in question. The transpiration rate of coffee is shown to be very greatly reduced during periods of slight water strain, this being ascribed to the high water tension in the plant.

Studies in tropical fruits.—X, Preliminary observations on transpiration during ripening, E. R. LEONARD (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 89-119, figs. 12).—The transpiration rate trends in tomatoes, papaws, mangoes, and bananas during ripening at 85° F. were studied by determining the rate of total loss in weight. Three types of trend were found: (1) Tomatoes showed an initial fall followed by a steady transpiration rate, (2) papaws an initial fall followed by at first a steady and then a continuously rising rate, (3) mangoes and bananas an initial fall followed by a steady rate and subsequently a trend similar to that of the respiration climacteric. In papaws the relation in time between internal concentration of CO₂ and O₂ and transpiration rate was followed, and that between respiration rate and transpiration rate in individual banana "fingers." The transpiration rates of the individual "hands" of a bunch of bananas are given, together with the changes in the pulp : skin ratio and a composite curve for the transpiration rate of an intact bunch deduced. The factors which may be responsible for the observed trends of transpiration are briefly discussed in relation to future investigations, emphasis being laid on the effect of temperature changes in the tissues on the vapor-pressure gradient and on changes in the water content of the tissues. A bibliography of 42 entries is included.

On the expression of sap by low pressure, E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 15-23, figs. 3).—When cotton leaves are compressed under pressures too low for immediate expression of the vacuolar sap, a sap is extruded after varying intervals which differs from the true vacuolar sap. When such low pressures are maintained almost as much sap can be expressed from the leaves as from previously frozen material, but at all times the rate of flow from living material is far less than from killed leaves. Neither the sap volume obtained under this low pressure nor the chlorine concentration in successive fractions is in harmony with the view that this sap is produced by filtration of the vacuole through the retaining protoplasmic layer. It is considered that this low-pressure sap is derived from injured protoplasm, possibly by some such process as vacuolation.

The chlorophyll-protein compound of the green leaf, E. L. SMITH (*Jour. Gen. Physiol.*, 24 (1941), No. 5, pp. 565-582, figs. 2).—Aqueous extracts of spinach and *Aspidistra* leaves yield highly opalescent preparations which are not true

solutions and differ markedly from colloidal chlorophyll in their spectrum and fluorescence. The differences between green leaf pigment and chlorophyll in organic solvents are shown to be due to a combination of chlorophyll with protein in the leaf. Both strong acid and alkali modified the absorption spectrum, acid converting the compound to the pheophytin derivative and alkali saponifying the esterified groups of chlorophyll. Even weakly acid solutions (pH 4.5) denatured the protein. Heating denatured the protein and modified the absorption spectrum and fluorescence. The protein was also denatured by drying. Low concentrations of alcohol or acetone precipitated and denatured the protein, whereas higher concentrations caused dissociation, liberating the pigments.

Detergents such as digitonin, bile salts, and sodium desoxycholate clarified the leaf extracts but denatured the protein, changing the spectrum and other properties. Inhibiting agents of photosynthesis were without effect on the absorption spectrum of the chlorophyll-protein compound. The red absorption band of chlorophyll possessed the same extinction value in certain organic solvents and in aqueous leaf extracts clarified by digitonin, although the band positions were different. Using previously determined values of the extinction coefficients of purified chlorophylls *a* and *b*, the chlorophyll content of the leaf extracts may be estimated spectrophotometrically. It was found that the average chlorophyll content of the purified chloroplasts was 7.86 percent. The protein content was 46.5 percent, yielding an average value of 16.1 parts per 100 parts of protein. This corresponds to a chlorophyll content of 3 molecules of chlorophyll *a* and 1 of chlorophyll *b* for the Svedberg unit of 17,500. It is suggested that this may represent a definite combining ratio of *a* and *b* in the protein molecule.

The comparative boron content of potato leaves and tubers produced under different cultural conditions, R. B. CARSON, W. E. TOTTINGHAM, and R. MACVICAR. (Univ. Wis.). (*Amer. Fert.*, 94 (1941), No. 7, p. 8).—An abstract.

Effects of phytohormone, potassium nitrate, and ethyl mercuric bromide on the germination and early growth of wheat, N. H. GRACE (*Canad. Jour. Res.*, 19 (1941), No. 6, Sect. C, pp. 211-215).—"Marquis wheat treated with a series of talc dusts containing indolylacetic acid, potassium naphthylacetate, potassium nitrate, and ethyl mercuric bromide was grown in soil in the greenhouse. Potassium naphthylacetate increased the final germination count 2.6 percent, while indolylacetic treatments failed to affect germination or early growth. Neither of these growth-stimulating chemicals interacted with potassium nitrate or ethyl mercuric bromide. Ethyl mercuric bromide retarded the germination rate but increased the final germination count. Potassium nitrate in conjunction with the organic mercurial disinfectant reduced final germination and the air-dry weight of young plants. On the average, dust treatments reduced the rate of germination but increased the air-dry weight of stems."

Distribution of growth hormone in shoots of two species of pine, N. T. MIROV. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry*, 39 (1941), No. 5, pp. 457-464, figs. 7).—Selection of desirable specimens in forest nurseries and in natural stands by physiological means is a very important problem. The author here presents the first step in an attempt to correlate hereditary vigor with the concentration of growth substance in forest trees (ponderosa and Torrey pines). If the suggestion of K. V. Thimann^{*} is accepted, viz "that

^{*} Studies on the growth hormone of plants.—VI. The distribution of the growth substance in plant tissues. *Jour. Gen. Physiol.*, 18 (1934), No. 1, pp. 28-34, figs. 2.

auxin in plants is present in two forms, free-moving auxin which can be collected by the diffusion method and the bound auxin which is obtained together with the free auxin by extraction of the tissues," then it appears from the results here presented that in Torrey pine auxin is stored in the xylem of the new as well as of the older stems. These studies suggest the possibility of finding a rather high concentration of growth substance near the cambium ring of mature pines and other forest trees.

The wound hormones of plants.—V, The synthesis of some analogs of traumatic acid, J. ENGLISH, JR. (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 4, pp. 941-943).—Continuing this series (*E. S. R.*, 83, p. 172), "a method for the synthesis of unsaturated acids of the type $\text{HOOC}(\text{CH}_2)_n\text{CH}=\text{CHCOOH}$ and $\text{HOOC}(\text{CH}_2)_n\text{CH}=\text{CH}-\text{CH}_2\text{COOH}$ has been developed and several representatives of these types were prepared. Δ^2 -Undecene-1,11-dicarboxylic acid and $\Delta^{2,7}$ -octadiene-1,8-dicarboxylic acid also have been prepared. These acids are found to be active plant wound hormones."

Further studies on the action of heteroauxin on *Phaseolus vulgaris*, L. POETHMEL (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 35-46, pl. 1).—Extensive studies have shown that 0.1 percent heteroauxin (β -indolylacetic acid) in agar is capable of inducing and stimulating curvatures, elongations, and various types of swelling in petioles of *P. vulgaris* from which the lamina has been removed. These changes occur in the petiole itself as well as in the joints at its base and just below the point of attachment of the lamina. These joints are referred to as the basal and distal joints, respectively. Heteroauxin is also capable of inhibiting the abscission of the distal joint, or of the whole petiole at the basal joint, if applied in appropriate positions after removal of the lamina. The heteroauxin may be said in effect to prolong the life of the petioles which have lost their normal function through removal of the lamina. The view is expressed that the heteroauxin in concentrated solutions operates by directly or indirectly controlling the distribution and movement of water within the plant. In the latter case, it may operate by changing the conditions in the petioles or stalks.

The relation between the four-carbon acids and the growth of oat seedlings, H. G. ALBAUM and B. COMMONER (*Biol. Bul.*, 80 (1941), No. 3, pp. 314-323, figs. 5).—It is believed clear that the four-carbon acid system is an important factor in the activity of auxin in controlling plant growth. There appears to be a close relation between these factors, indicating that both participate in the various auxin-sensitive processes regulating plant growth. The data presented indicate that the four-C acids participate directly in the plant growth processes. The conclusions by Commoner and Thimann (*E. S. R.*, 85, p. 322) can therefore be extended to include many of the known effects of auxin.

Induced formation of a β -gentiobioside in tomato roots, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 387-391).—"When tomato plants are grown in sand cultures to which *o*-chlorophenol has been added, a β -*o*-chlorophenyl glycoside is formed in the roots. This has been shown to be β -*o*-chlorophenyl-gentiobioside through the preparation of the acetyl and propionyl derivatives which were found to be identical with the corresponding synthetic compounds."

The effect of vitamin B₁ and nicotinic acid upon the growth and yield of spring oats and tomatoes in sand culture, W. G. TEMPLEMAN and N. POLLARD (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 133-147).—Application of B₁ and nicotinic acid, each at two concentrations and in the four combinations of these two concentrations, failed to affect the yield of spring oats or tomatoes grown in sand and supplied with an inorganic nutrient solution.

Bactericidal effect of ultraviolet radiation, H. C. RENTSCHLER, R. NAGY, and G. MOUBOMSEFF (*Jour. Bact.*, 41 (1941), No. 6, pp. 745-774, figs. 9).—Using a method described for uniformly seeding Petri dish surfaces with micro-organisms and an integrating ultraviolet meter responding only to the bactericidal wave band to obviate errors in light fluctuations, the variation in resistance of individual bacteria in culture to irradiation was shown to be considerably greater than hitherto suspected. The same organism had a widely different resistance at different life cycle stages, and in a normal culture of a species such as *Escherichia coli* the resistance of different bacteria at the same stage may differ. Temperature had a negligible influence on resistance to irradiation provided it was not directly injurious. A sublethal irradiation dose retarded the subsequent rate of colony development. It was found that the average resistance to irradiation of individual cells of different types of bacteria was roughly of the same order of magnitude, and the apparent large variation was due to clumping and shielding. The relation between amount of radiation and percentage of bacteria killed is determined by the distribution of bacteria of different resistance rather than the probability of hitting a vital spot in a given organism by a photon. There are 15 references.

Some fundamental aspects of photosynthesis, J. FRANCK (*Sigma Xi Quart.*, 29 (1941), No. 2, pp. 81-105, figs. 16).—A discussion, without references, of some modern concepts of the mechanism of photosynthesis.

Microbial thermogenesis in the decomposition of plant materials, I, II. (Iowa Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 6, pp. 689-697, figs. 2; pp. 699-724, figs. 18).—Two papers in this series are presented.

I. *An adiabatic fermentation apparatus*, A. G. Norman, L. A. Richards, and R. E. Carlyle.—“The requirements of an apparatus for the study of microbial thermogenesis by decomposing plant materials are outlined. The construction and use of an adiabatic apparatus meeting most of these requirements are described. By means of a photoelectric system the temperature of the bath surrounding the fermentation vessel is controlled by the temperature of the contents, in this way avoiding all heat loss.”

II. *Factors involved*, R. E. Carlyle and A. G. Norman.—In preliminary tests in Dewar flasks, moistened oats straw usually attained temperatures of 45°-48° C. within 30-60 hr. Pre-extraction of the straw with water, dilute acid, or dilute alkali much reduced the maximum temperature and increased the time before it was reached. In the adiabatic apparatus referred to above, maxima of 70°-73° were obtained in 40 hr. or less. The rate of heat evolution was not uniform, and two well-defined maxima were apparent (about 40° and 60°), coinciding with the points of maximum activity of mesophilic and thermophilic populations. The extent of decomposition was less than 4 percent. The rates of heat and of CO₂ evolution were closely related. Pre-extraction with reagents of increasing severity markedly diminished the rate of heat evolution but had no serious effect on the maximum temperature attained. Two maxima were invariably found in the temperature rate curves. Absence of additional available N had no effect on the thermogenic processes in one temperature ascent trial. With a mixed population, the first maximum in heat rate of evolution was always greater than the second, due to the prior removal of some of the most readily available constituents by the mesophilic flora. Numbers of mesophilic and thermophilic bacteria were found to increase enormously at the time of most rapid heat evolution in their respective ranges. Low final counts of mesophilic organisms were obtained, suggesting that the active mesophilic population is composed mainly of non-spore-formers. Pure culture decompositions were carried out with *Aspergillus fumigatus* and an unidentified bacillus,

both proving active only in the mesophilic range but capable of raising the temperature of the straw from 25° to nearly 55°.

The adsorption of H⁺ by bacteria as measured by the glass electrode. T. M. MCCALLA. (Kans. Expt. Sta.). (*Jour. Bact.*, 41 (1941), No. 6, pp. 775-784).—Bacteria were shown by this method to adsorb H⁺, living and heat-killed cells having about the same capacity. However, the adsorptive capacity varied among species. Adsorbed ions were exchangeable. There was evidence that the toxic or disinfecting property of certain electrolytes is associated with adsorbability of the cation.

The mycorrhizal relations of larch.—II, The role of the larch root in the nutrition of *Boletus elegans* Schum., J. E. How (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 17, pp. 121-131, pl. 1).—Continuing this study (E. S. R., 83, p. 323), the effects of adding excised primary roots of conifer seedlings to cultures of *B. elegans* established that a water-soluble substance capable of stimulating the growth of the fungus is present in the roots of European and Japanese larch, but not in those of Scots pine. During the experiments, the roots became subject to a quasi-parasitic attack by the fungus, which penetrated by means of mechanical pressure exerted by the growing mycelium.

GENETICS

Somatic segregation. D. F. JONES. (Conn. [New Haven] Expt. Sta.). (*Bot. Rev.*, 7 (1941), No. 6, pp. 291-307).—A review of the possible relations of changed body characteristics to atypical fertilization, chromosome elimination, somatic mutation, deletion, and a discussion of paired changes, chromosome bridges, and position effect, with 161 references.

A heritable female-sterile type in cotton. G. N. STEOMAN. (N. Mex. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 5, pp. 167-168).—The variant described as probably a simple (3:1) recessive to normal appeared in a progeny from an individual plant selection of Acala 8.

Sterility and aberrant chromosome numbers in Caloro and other varieties of rice. J. W. JONES and A. E. LONGLEY. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 7, pp. 381-399, figs. 17).—"Haploids in rice found at several experiment stations, and haploid, sterile diploid, aneuploid, triploid, and tetraploid plants in the Caloro variety of rice that arose as mutations at the Biggs Rice Field Station, Biggs, Calif., are described briefly. The polyploid types appear to be of no practical value. Cytological studies of these mutants show the presence in the United States of nearly all the aberrant forms reported in rice in Japan and India. Comparative studies of the gametic tissue of normal and sterile diploid plants have shown that the sterile plants have an abnormal meiotic behavior despite their diploid chromosome number." There are 54 references.

Knob positions on teosinte chromosomes. A. E. LONGLEY. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 7, pp. 401-413, figs. 3).—In gross morphological characters the chromosomes of teosinte are very similar to each other and to their homologs in corn, but the position and number of the chromosome knobs have characteristic differences making teosintes from different localities reasonably distinguishable. These distinguishing features indicate that teosintes differ in their relationship to each other and to corn, those of northern Guatemala being slightly more cornlike than those from southern Guatemala, whereas perennial teosinte from Mexico is thought to have chromosomes even more similar to those of corn. Considering only the morphological characters of the chromosomes, it seems possible that a few gene mutations in the original type of teosinte may have given rise to a form that could have become the progenitor of corn.

A new mutant leaf character in sweet clover, E. E. HAETWIG. (U. S. D. A. and Ill. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 5, pp. 171-172, fig. 1).—A unifoliolate deviation from the normal trifoliolate leaf of sweetclover appearing in the first selfed generation of a selection of *Melilotus officinalis* was observed to differ from normal by a single recessive gene. The leaves of the unifoliolate plants are nearly sessile and vary in shape from a single leaf resembling an enlarged central leaflet of a trifoliolate leaf to various degrees of lobing. The plants with unifoliolate leaves have all had normal floral development.

New genetic characters of the tomato, P. A. YOUNG. (Tex. Expt. Sta.). (*Amer. Nat.*, 75 (1941), No. 758, pp. 280-282).—Descriptions are presented of three new genetic characters, namely, sticky fruit, yellowish bordered leaves, and an unusual double-type fruit found at the Tomato Disease Laboratory, Jacksonville, Tex. Crosses of Garra prihe, an Italian-type tomato extremely susceptible to puffing, with Marglobe, Riverside, etc., yielded 109 seedlings, all of which were badly puffed, suggesting that the puff character was dominant in these particular combinations.

Relation between genes and carotenoids of the tomato, A. L. LERSEN, F. W. WENT, and L. ZECHMEISTER (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 5, pp. 236-242).—Evidence was obtained that two pairs of genes, *R* and *r*, causing red and yellow flesh color in tomatoes, and *Y* and *y*, producing yellow or colorless skin, are unrelated not only genetically but also in their chemical effect. The gene *R* affects only the red and yellow plastid pigments, chiefly lycopene, and to a much less extent carotenes and xanthophylls. The gene *Y* had no influence on these plastid pigments, but caused a tenfold increase in an alkali-soluble yellow pigment which generally occurs in tomatoes. This latter effect was restricted to the epidermis.

The effect of diploid and triploid seedling stock on the growth and yield of certain Jonathan apple trees, F. N. HEWETSON. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 341-344, figs. 3).—Records taken on a group of Jonathan trees budded in 1933 on seedlings of Northern Spy, Jonathan, and Yellow Bellflower (diploids) and of Baldwin (triploid) showed that the chromosomal make-up of the stock is a factor. Jonathan trees on Baldwin seedlings were significantly smaller and yielded less than trees on seedlings of the three diploids. Within the diploid group there was no significant difference in growth and yield attributable to size differences at the time of planting, but with respect to yield the trees on Yellow Bellflower seedlings produced less than one-half the yield of those on Jonathan and Northern Spy, although their growth was comparable. Trees on triploid seedlings averaged smaller-sized fruit than did those on diploid seedlings.

Change from self-incompatibility to self-compatibility accompanying change from diploidy to tetraploidy, A. B. STOUT and C. CHANDLER (*Science*, 94 (1941), No. 2431, p. 118).—Some "4n" branches were developed on "2n" seedlings on 15 plants of *Petunia axillaris* by use of colchicine. In all cases self-pollinated flowers of diploid branches produced no seeds, but self-pollinated flowers of tetraploid branches produced abundant seed. Pollen from flowers on tetraploid branches resulted in abundant seed formation when applied to pistils of flowers on the self-incompatible diploid branches. Other combinations yielded no seeds.

[Papers on genetics, physiology of reproduction, and lactation presented at the 1940 annual meeting of the American Society of Zoologists] (*Anat. Rec.*, 78 (1940), No. 4, Sup., pp. 45-148).—Abstracts and demonstrations begun on the pages indicated are included, as follows: Page 45, Growth of Endocrine Glands and Viscera in Normal White Leghorn Chicks Compared With Limited

Diet and Estrogen Injected Birds, by W. R. Breneman; page 46, Precocious Sexual Maturity After Administration of Estrogens in Female Domestic Fowl, by O. K. Moore (Univ. Md.); Suppression of the Development of Reproductive Function in the Female Rat With Androgen, by J. G. Wilson, W. C. Young, and J. B. Hamilton; page 47, Concentration as a Factor Influencing the Absorption of Androgens Through the Skin of Young Male Rats, by J. K. Lamar and A. R. Abarbanel; page 48, Relation of Interstitial Cell Hyperplasia to Secretion of Male Hormone by the Sparrow Testis, by C. A. Pfeiffer and A. Kirschbaum; Further Effects of Colchicine on Developing Chicks, by E. Higbee; Some Reactions of Intraocular Ovarian Transplants in the Rabbit to Gonadotropic Stimulation, by C. E. Lane and J. E. Markee; page 49, The Experimental Lengthening of the Gestation Period in the Rabbit, by C. W. McNutt and P. B. Sawin; Some Factors Underlying the Failure of Cyclic Mating Behaviour in the Female Albino Rat, by J. L. Boling, R. J. Blandau, B. Rundlett, and W. C. Young; page 51, Duplication of the Seminal Vesicles in Mice of the *C* Strain, by C. W. Hooker and L. C. Strong; page 54, Limb Bud Transplantations of "Creepers" (Chick Embryos, by V. Hamburger; Development of Mouse Melanophores in the Coelom of Chick Embryos, by M. E. Rawles; page 58, Post-Parturitional Heat and the Time of Ovulation in the Albino Rat, by R. J. Blandau, E. S. Jordan, and A. L. Soderwall; The Duration of Functional Life of Spermatozoa in the Female Genital Tract of the Rat, by R. J. Blandau, A. L. Soderwall, and E. S. Jordan (E. S. R., 85, p. 465); page 77, The Inhibition of the Oxygen Consumption of Early Chick Embryos by Cyanide, Azide, and Carbon Monoxide, by F. S. Phillips; The Effect of Carbohydrates and Inhibitors of Heterotaxia in Chick Embryos, by P. Gray, M. L. Dodds, and H. Worthing; page 78, The Increased Mortality of the Developing Chick Embryos in Riboflavin-Deficient Eggs, by A. L. Romanoff (Cornell Univ.); page 85, The Relation of Light to Sexual Inactivity in the Male Starling, by J. W. Burger (E. S. R., 84, p. 177); page 86, Clutch Length in Relation to Period of Illumination in the Domestic Fowl, by T. C. Byerly and O. K. Moore (Univ. Md.); page 87, The Extraction of a Lactogenic Substance From Liver and Blood, by B. Cunningham, E. A. Bickell, and M. Tanner; Influence of Normal Male Urine Gonadotropin on Spermatogenesis in Hypophysectomized Immature Rats, by J. H. Leatham and E. J. Mills, Jr.; page 88, The Effect of Pituitary Gonadotrophins on the Testicles of Hypophysectomized Immature Rats, by R. O. Greep, H. B. van Dyke, and B. F. Chow; Pronounced Stimulation of Testes of Doves and Pigeons by More Recent Preparations of Pregnancy Urine, by O. Riddle and E. L. Lahr; page 89, Observations on the Chick Pituitary, by F. Payne; A Comparative Histology of the Bird Pituitary, by B. T. Painter and H. Rahn; The Effect of Adrenalectomy Upon the Histology of the Anterior Lobe of the Rat Hypophysis, by A. J. Gatz and R. Kendall; page 90, The Thyrotropic Potency of the Mouse Anterior Pituitary, by A. E. Adams and B. C. Allen; page 91, Effect of Sex and Pituitary Hormones on the Blood Picture of the Normal and Hypophysectomized Rat, by E. P. Vollmer, A. S. Gordon, I. Levenstein, and H. A. Charlipper (E. S. R., 85, p. 330); page 110, Resemblance of Body, Adrenal, and Pituitary Weights Among Rat Litter Mates, by E. H. Yeakel; page 115, Methods of Hormone Administration for the Induction of Heat in the Spayed Female Guinea Pig and Rat, by A. L. Soderwall, R. J. Blandau, and E. S. Jordan; page 119, The Developmental History of Melanophores in the Wing Skin and Feather Germs of the Barred Plymouth Rock Embryo, by R. L. Watterson; page 120, Direct Influence of Hormones on Melanophore Differentiation in Birds, by H. L. Hamilton; page 129, Experiments on the Morphogenesis of the Feather, by F. R. Lillie and H. Wang;

page 136, Antihormone Production to Crude and Purified Pregnant Mare Serum Preparations, by A. S. Gordon, L. Levenstein, and H. A. Charipper (E. S. R., 84, p. 175); page 137, Spontaneous Diurnal Activity in a Genetically Hypopituitary Animal, the Dwarf Mouse, by C. M. Osborn (Ohio State Univ.): The Effect of Injections of Anterior Pituitary Extract (Buffington) Upon Sexual Phenomena in the Adult Female Opossum, *Didelphys virginiana*, by O. E. Nelsen and E. L. White; page 138, Further Studies on the Effects of Thyrotropic Hormone on Chick Embryos, by G. L. Woodside (Mass. State Col.); page 143, Changes in Arian Bone Due to Injected Estrogen and During the Reproductive Cycle, by M. A. and W. Bloom, L. V. Domm, and F. C. McLean; Seasonal Hyperossification of the Skeletal System in Female Quail, by A. R. Ringdon (Univ. Minn.); page 144, Androgenic Ovaries in the Rat Produced by Postnatal Injections of Estrogen, by C. D. Turner and R. Haffen; Further Observations on Sexual Modifications in Brown Leghorn Males Following Embryonic Injection of Estrogens, by L. V. Domm (E. S. R., 82, p. 471); page 145, The Effects of Embryonic Injection of Estrogens on Sexual Characters of Brown Leghorn Hens, by L. V. Domm; The Relation of Vitamin E to the Effectiveness of Testosterone Injections in Caponized Male Fowl, by F. B. Adamstone (Univ. Ill.); page 146, Some Effects of Sex Hormones on Broodiness in Fowl and Pigeon, by N. Collias; and page 147, Changes in the Rat Thymus Following Various Experimental Procedures, by V. Rauch and A. J. Stanley (La. State Univ.).

[Genetic studies by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt.* 1940, pp. 62-63, 66, 187, 191-193, 211, 212-213).—Included are the following studies by A. L. Shealy, W. G. Kirk, R. M. Crown, N. R. Mehrhof, O. W. Anderson, Jr., R. W. Kidder, V. E. Whitehurst, Jr., W. F. Ward, and M. E. Hammond: Breeding and performance of beef and dual-purpose cattle, poultry breeding, relation of age and breed to birth weight and performance of calves and milk production of beef and dual-purpose breeds of cattle, and performance of crossbred Columbia sheep.

Heredity in farm animals, J. EDWARDS, J. HAMMOND, and A. WALTON (*Jour. Roy. Agr. Soc. England*, 101 (1941), pt. 2, pp. 1-16, figs. 3).—A general discussion is given of known facts in inheritance in different classes of animals, especially dairy cattle, and the effects of different methods of breeding.

Sheep breeding problems in Blackland of Texas, B. L. WARWICK and H. O. HILL. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser*, 11 (1941), No. 6, pp. 32-33, figs. 6).—Ewes produced by crossing Merino and Rambouillet ♀s from horned stock with Dorset horned rams were especially attractive for the production of fat lambs when bred to mutton rams. Attempts were made to breed off the horns from such ewes by crossing and backcrossing with Romney, polled and horned Rambouillet, and Dorset breeds.

Waved—a new coat type in rabbits, J. N. PICKARD (*Jour. Genet.*, 42 (1941), No. 1-2, pp. 215-222, pl. 1).—The occurrence of waviness in varying extent in the coat of the finest exhibition types of rex rabbits is noted. The condition was caused by an autosomal gene recessive to the normal. No linkage was found with brown or blue color. Molting in the young waved rabbits was so extensive and rapid as to cause practical nakedness.

Fertility in Flemish and smaller types of rabbit, W. K. WILSON (*Nature [London]*, 146 (1940), No. 3709, pp. 721-722).—Fertility of Flemish does was only 43 percent as compared with Beveren and Dutch does which gave fertility of 91 and 88 percent, respectively. However, it was noted that crosses of Flemish does with other breeds gave high percentages of fertility.

"Pigtail," a hereditary tail abnormality in the house mouse *Mus musculus*, F. A. E. CREW and C. AUERBACH (*Jour. Genet.*, 41 (1941), No. 2-3, pp. 267-

274, pls. 2, figs. 2).—An abnormality involving, in extreme conditions, one or more curves in the tail of the mouse not unlike flexed, as described by H. R. Hunt, R. Mixter, and D. Permar,⁴ was controlled by one or more recessive genes. Modifying factors also operated. In genetically pig-tailed litters the condition was not influenced by age of mother, degree of expression in the parents, degree of inbreeding, or selection. A slightly negative correlation between litter size and percentage of manifestation in homozygous litters suggested some intra-uterine, non-genetical influence on the development of the abnormality.

Parallel variation in plumage colours of various breeds of domestic fowl, S. G. PETROV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 487-490*).—There are tabulated a total of 179 varieties of 48 normal-size and bantam breeds of fowls showing recurrence in both groups of similar plumage variations. White varieties occurred in 32 of the breeds, black in 28, wild type in 22, and buff in 17. The colors first occurred in the standard breeds and were intensified by selection and inbreeding on crossing with bantams. A synthetic combination of the plumage characters was thus produced.

Experimental modification of breeding cycles in goats, T. H. BISSENETTE (*Physiol. Zool., 14 (1941), No. 3, pp. 379-383*).—The breeding cycles of goats were controlled by light exposure. Increases in the daily lighting by artificial means caused a cessation of heat periods, whereas oestrus was induced in four does following reduction in the amount of light and seven kids were born during the first half of December. Thus partial reduction of the sexual cycles was effected by reducing the amount of lighting without changing the temperature to which the does were exposed in the spring.

Manifestations of incompatibility in limb grafts made between bird embryos of different species, H. L. EASTLICK. (Univ. Mo. et al.). (*Physiol. Zool., 14 (1941), No. 2, pp. 136-144, pls. 2*).—Limb bud transplants from partridge, quail, guinea fowl, and duck embryos to chick embryos at from 2.5 to 3.5 days of incubation showed that the interspecies grafts exhibited an incompatibility reaction after hatching. One duck graft recovered and persisted, whereas others did not generally heal following the incompatibility reaction between species.

Transplantation of limb primordia of homozygous and heterozygous chondrodystrophic ("creeper") chick embryos, V. HAMBURGER (*Physiol. Zool., 14 (1941), No. 3, pp. 355-365, pl. 1*).—Transplantation of approximately 100 limb primordia from heterozygous and homozygous creeper fowl (E. S. R., 83, p. 475) to normal White Leghorn embryos led to the suggestion that the *Op* gene caused some deficiency in general metabolic or respiratory mechanism. Localized manifestations resulted from differential susceptibility of various primordia. Evidently the creeper factor causes growth disturbances, but it is considered to be independent of histogenic and growth disturbances. More than 50 percent of the transplants were well developed at the third day of incubation. Histological studies were made of the tissues.

Rat prostate and seminal vesicle grafts in relation to the age and sex of the hosts, D. PRICE (*Physiol. Zool., 14 (1941), No. 2, pp. 145-162, pls. 2*).—Ventral prostates and seminal vesicles transplanted from young and old rats were found to grow and differentiate or be maintained for from 13 to 245 days in old and castrated hosts of both sexes. It appears that the androgen stimulation might result from the ovaries or adrenals of the ♀ host.

Response of testes of immature pigeons to gonadotrophins, E. L. LAHR, O. RIDDLE, and R. W. BATES (*Endocrinology, 28 (1941), No. 5, pp. 681-693, figs. 17*).—Continuing previous studies⁵ the authors found that daily injections of 32

⁴ Genetics, 18 (1933), No. 4, pp. 325-366, figs. 2.

⁵ Amer. Jour. Physiol., 116 (1936), No. 1, pp. 94-95.

pigeons 1.5 mo. old with gonadotropic extracts resulted in rapid and progressive growth and maturation of the testes. Histological study after 4, 8, 12, and 16 days' treatment showed that there first occurred a marked hypertrophy of the intertubular, interstitial, and germinal tissue with the initiation of spermatogenesis. As determined by study of 33 uninjected birds, testis development after injection with the gonadotropic hormones roughly paralleled normal development. Injections of LH (lutinizing hormone) caused greater response than FSH (follicle-stimulating hormone) during the first 4 days, but both caused equal development after from 7 to 14 days. Testes of doves differed from those of pigeons by forming large, fluid-filled spaces in the intertubular areas for from 3 to 5 days. These spaces disappeared by the time mature sperm were formed. The gonadotropic hormones injected included pituitary FSH and LH, pregnant-mare serum, human pregnancy urine, etc. All these preparations stimulated growth of the testes in hypophysectomized birds.

Vitamin A and the vaginal response to sex hormones in the rat, I, II (*Endocrinology*, 28 (1941), No. 5, pp. 765-768).—Two studies are presented.

I. Estrogens, M. W. Burrill and R. R. Greene (pp. 765-766).—Although H. M. Evans and K. S. Bishop^{*} reported that vitamin A deficiency caused continued vaginal cornification in rats, there was no evidence of increased sensitivity of mature castrated ♀s on a vitamin A-deficient ration to oestrogen administration. When additional vitamin A was supplied in the diet, the same ability to respond to oestrogen by vaginal cornification was retained.

II. Androgens, M. W. Burrill and D. Nelson (pp. 767-768).—The mucifying action of testosterone propionate on the castrate rat uterus was inhibited by vitamin A-deficient rations which also produced cornification of the vaginal epithelium. Doses of as much as 8 mg. of testosterone propionate were administered to castrated ♀s on the deficient ration.

The psychical activity of male and female sex hormones of horse urine, P. ENGEL (*Endocrinology*, 28 (1941), No. 5, pp. 849-850).—The same extract of stallion urine gave positive vaginal reactions in rats and induced the mating instinct in ♂ guinea pigs.

Spontaneous intersexuality in the rat, F. E. D'AMOUR and D. FUNK (*Endocrinology*, 28 (1941), No. 5, pp. 727-728, figs. 6).—Eight cases of spontaneous intersexuality in rats were noted. Externally they were ♀, but internally the ovaries were absent. There were cryptorchid testes without spermatogenesis and with other abnormalities. There were no cyclic changes in vaginal smears.

The mouse uterine weight method for the assay of estrogens, J. S. EVANS, R. F. VARNY, and F. C. KOCH (*Endocrinology*, 28 (1941), No. 5, pp. 747-752, figs. 5).—A method found very sensitive and reliable for assaying oestrogens and based on weight changes in the uterus of the immature mouse following three twice-daily injections is described.

Regressive changes in the reproductive system of male rats induced by stilbestrol, C. S. MATTHEWS, F. E. EMBRY, and E. L. SCHWABE (*Endocrinology*, 28 (1941), No. 5, pp. 761-764, figs. 5).—Degeneration of the testes was induced by long oral administration of stilboestrol to mature rats. Regression, although to a lesser extent, occurred in the epididymis, seminal vesicles, and prostates. In about 2 weeks, 1 mg. three times per week caused shrinkage of the scrotum, and soon thereafter the testes were difficult to find and later were in the abdomen. Interest of such ♂s in ♀ rats was not observed.

Synthetic estrogen, I [trans. title], F. v. WESSELY, E. KERSCHBAUM, A. KLEEDORFER, F. PRILLINGER, and E. ZAJIC (*Sitzber. Akad. Wiss. Wien, Math. Naturw.*

^{*} Anat. Rec., 23 (1922), No. 1, pp. 17-18.

Kl., 149 (1940), *IIb*, No. 2, pp. 71-102).—This paper deals with theoretical considerations and actual experimental procedures involved in the synthesis of a number of compounds which are described and which, upon assay, were shown to have oestrogenic activity.

Female sex hormones, E. A. DOISY and P. E. SMITH (*Nature [London]*, 146 (1940), No. 3706, pp. 624-625).—A historical account of theelin extraction from human placentas and urine and from sows' ovaries and the later synthesis of α -dihydrotheelin in 1940 is presented. The presence of two gonadotropic hormones, FSH (follicle-stimulating hormone) and LH (luteinizing hormone), in the pituitaries is historically developed.

Comparison of assay methods using International Standard lactogen, J. MEITES, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 28 (1941), No. 5, pp. 707-709).—Comparison of the intrapectoral, subcutaneous, and intradermal methods of assaying lactogen with pigeons showed that positive responses were obtained in the respective tests with 0.1, 0.125, and 0.000624 mg. of the hormone. Thus it was found that the intradermal (micro) method was 160 times more sensitive than the subcutaneous assay method. Differences in the volume injected caused no change in the crop response.

Studies on pituitary lactogenic hormone.—I, Electrophoretic behavior, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Gen. Physiol.*, 23 (1940), No. 4, pp. 433-438, figs. 3).—Electrophoretic study of the lactogenic hormone of the pituitary indicated a high degree of homogeneity.

Studies on pituitary lactogenic hormone.—II, A comparison of the electrophoretic behavior of the lactogenic hormone as prepared from beef and from sheep pituitaries, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 11, pp. 2925-2927, figs. 2).—Lactogenic hormones from sheep and cattle pituitaries were not distinguishable by electrophoretic behavior. Both had an isoelectric point of pH 5.73.

Studies on pituitary lactogenic hormone.—III, Solubilities of sheep and beef hormones, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Gen. Physiol.*, 24 (1941), No. 3, pp. 303-309, figs. 2).—Further chemical studies of the lactogenic hormone from sheep and cattle pituitaries showed them to contain but one component. However, the components of the extracts from both animals were chemically different, thus indicating species specificity.

Studies on pituitary lactogenic hormone.—IV, Tyrosine and tryptophane content, C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 136 (1940), No. 3, pp. 709-712).—It was found that samples of lactogenic hormone from both sheep and beef cattle pituitaries contained practically the same tryptophan content, but a species specificity was noted in the tyrosine content in that the beef pituitary averaged 5.73 percent and the extract from sheep pituitary, 4.53 percent.

Inhibition of lactation in the rat, A. EDELMANN and R. GAUNT (*Physiol. Zool.*, 14 (1941), No. 3, pp. 373-378).—Evidently the lactation-inhibiting properties of gonadotropins were mediated through the ovaries, since inhibition did not appear to occur after the administration of several of these hormones to ♀ rats ovariectomized shortly after parturition but did occur to a greater or lesser extent in intact ♀s. Oestrogens and testosterone propionate inhibited lactation in both intact and ovariectomized rats immediately after parturition. Indirect evidence was suggested that ovarian stimulation released nonoestrogenic substances which assisted in lactation inhibition. The experiment was conducted with ♀ rats ovariectomized on the day of parturition and injected for 15 days with the various hormones, and lactation was ascertained by growth of the young.

The thymus gland in relation to sex hormones and reproductive processes in the albino rat. J. C. PLAGGE (*Jour. Morphol.*, 68 (1941), No. 3, pp. 519-545, figs. 8).—To contribute to the age-old question of the relation between the thymus and the reproductive process, the author found in the normal rat that the thymus increases in weight until about 60 days of age, after which involution sets in in the ♂. In the ♀, involution of the thymus is postponed until about 120 days of age. The changes in the absolute weight of the thymus were related to gonad development. Castration at various times between birth and 80 days of age resulted in definite increases in the weight of the thymus which were marked for 273 days and were still present at 547 days. Even with castration 1 yr. after the thymus had decreased to about one-third of its puberal size, the degenerated appearance of the gland was entirely altered. Injection of various ♂ and ♀ hormone preparations caused involution of the thymus in both normal and castrated rats of both sexes roughly proportional to the dose administered. The complete removal of the thymus at 1 day of age had no effect on spermatogenesis; thus the relation between the hormones and the thymus is not reciprocal. These results were based on about 1,400 rats.

FIELD CROPS

[Field crops research in Arizona]. (Partly coop. U. S. D. A.). (*Arizona Sta. Rpt. 1940*, pp. 10, 16, 17, 37-45, 52, 53-55, 56-57, 83-90, figs. 3).—Progress reports are made from agronomic experiments (E. S. R., 84, p. 33) at the station and substations, including variety tests with cotton, grain sorghum, sorgo, wheat, barley, oats, alfalfa, castor-beans, safflower, soybeans and edible soybeans, and green manure crops; breeding work with wheat (for smut and rust resistance), alfalfa, and cotton; experiments concerned with irrigation needs, heat resistance, and lint strength of cotton; relation of nutrients, especially N, to lodging of wheat; studies of root nodule bacteria of some leguminous plants native to Arizona; fertilizer tests and measurement of winter growth of progenies for grazing value with alfalfa; production of seed of Bahia grass and woolly fingergrass; sugar beet seed production studies, including effects of planting dates, spacing, removal of leaves as in grazing, soil temperature, and N supply; cultural and interplanting (with hegari) tests with soybeans; a date-of-seeding and fertilizer test with Punjab flax; range studies concerned with economic value of some range plants under cultivation, water requirements of range plants, and fertilizer tests; relation of climatic and grazing conditions to desert grassland range; food reserves of burroweed in relation to control practices; and control of bindweed, white horsenettle, and nutgrass by different treatments.

[Field crops investigations in Florida]. (Partly coop. U. S. D. A., Ga. Coastal Plain Expt. Sta., et al.). (*Florida Sta. Rpt. 1940*, pp. 38-58, 94, 118-119, 125-126, 170, 174-175, 176, 177-184, 191, 193-194, 203-204, 212, figs. 3).—Reports of progress are made again (E. S. R., 83, p. 616) from continued experimentation with field crops and related agronomic research at the station and substations by W. A. Carver, F. H. Hull, G. E. Ritchey, W. E. Stokes, W. A. Leukel, J. L. Stephens, J. P. Camp, H. Mowry, R. E. Blaser, F. Boyd, F. Clark, M. N. Gist, M. N. Walker, F. S. Jamison, A. H. Eddins, F. B. Smith, J. R. Neller, W. T. Forsee, F. T. Boyd, T. Bregger, R. W. Kidder, F. D. Stevens, R. R. Kincaid, J. D. Warner, W. M. Fifield, and W. F. Ward, including breeding work with corn, sweet corn, oats, Napier grass, pigeonpeas, sugarcane, and peanuts; variety tests with corn, oats, barley, sugarcane for sugar and sirup, potatoes, peanuts, soybeans, clover, lespedeza, sorghums, sorgo, and miscellaneous forage and pasture grasses and

legumes and cover crops; strain tests with pearl millet, Napier grass, pigeonpeas, potatoes, and white clover; production tests with ramie; spacing and rate of seeding of potatoes; fertilizer tests with sea-island cotton, corn, oats, sugarcane, potatoes, ramie, peanuts, clover, lespedeza, redtop, and Dallis, Carib, Napier, and Para grasses; study of development and deterioration of roots in relation to growth of pasture plants (Sudan grass) under different fertilizer and cutting treatments; response of corn, soybeans, and other crops to trace elements on Everglade peat and muck soils; green manure crops for potatoes; sugarcane studies, including the best depth of water table on sawgrass peat for cane and sugar production, effects of acidulated and basic phosphates as fertilizer on yield of cane and juice quality, including effect on clarification, potash requirements, and a study of cane deterioration following temperatures of 24° F.; and characteristics of F31-762, an outstanding cane seedling for sirup purposes; cultural tests with corn, soybeans, and peanuts; seed storage; methods of inoculating legumes, particularly clovers, in Florida soils; effects of fertilizers, varieties, and other factors in production of flue-cured tobacco; tobacco plant bed fertilization; study of yield and quality of sea-island cottons and the effect of place of growth of the seed on yield and quality of the cotton; and crop rotation studies with corn, cotton, crotalaria, and Austrian Winter peas, corn and runner peanuts rotating with crotalaria and with native cover crops, and corn in a 2-yr. rotation with crotalias and weeds or natural land cover.

Pasture research, besides that mentioned above, dealt with effects of fertilizers on yield, grazing value, chemical composition, and botanical make-up of pastures, with special reference to carpet grass; eradication of weeds in tame pastures; forage nursery and plant adaptation studies and forage and pasture grass improvement, especially with Napier grass and woolly fingergrass; growth behavior and relative composition of range grasses as affected by burning and the effect of burning on maintenance of natural grass stands and upon the establishment of improved grasses; value of certain grasses for pasture on cut-over, dry, sandhill lands; annual burning of unimproved wiregrass pasture on sandhills during winter months; studies of pasture legumes, of Napier grass for pasture purposes, and of water pasture; methods of establishing permanent pastures under various conditions; and pasture studies on peat and muck soils of the Everglades.

[Field crops experiments in Maine]. (Partly coop. U. S. D. A.). (*Maine Sta. Bul.* 400 (1940), pp. 227-229, 248-249, 255-256, 272-274).—Agronomic work (*E. S. R.*, 83, p. 333), by R. M. Bailey, J. A. Chucka, A. Hawkins, D. S. Fink, B. E. Brown, G. W. Simpson, and R. Bonde, reported on briefly, comprised fertilizer tests with potatoes, including different formulas, variations in K and B contents, and P and K carriers; roguing service for producers of foundation seed potatoes; and variety tests with corn, oats, wheat, barley, and alfalfa.

Fertilizers and field crops, I-III, E. L. WORTHEM ([*New York*] *Cornell Sta. Buls.* 748 (1941), pp. 28, figs. 7; 749 (1941), pp. 26, figs. 6; 750 (1941), pp. 15, figs. 10).—The series reports crop responses to various fertilizer treatments in fixed rotations for extended periods and includes analyses of financial returns based on current fertilizer prices and estimated average values for crops in the field unharvested. Estimates of increases in pounds of total digestible nutrients and their costs per 100 lb. are also included. A number of crop production experiments are reported.

I. *Results of sixteen years of experiments on Volusia silt loam in Allegany County, New York.*—On the Alfred experimental field, the rotation of silage corn, oats, and 2 yr. of clover and timothy hay received five different fertilizer treatments, both with and without manure. All the treatments increased yields in ex-

cess of their cost as an average of 16 yr. The greatest increase in crop value over fertilizer cost came from application of superphosphate at the acre rate of 800 lb. for each 4-yr. rotation, and the largest percentage return on the investment in fertilizer resulted from 400 lb. of superphosphate. N and K were applied at average losses per rotation. P and N or P and K combined produced crops valued at a substantial increase per rotation over cost of treatment, but increases in digestible nutrients cost, on the average, slightly more per 100 lb. than did those from P alone.

Sodium nitrate was as effective in top dressing timothy as a 6-8-4 fertilizer applied at three times the rate when the rotation as a whole received the same amounts of P and K. About 3.5 tons of manure was needed to be as effective as 100 lb. of sodium nitrate in top dressing.

Corn for silage at several spacings gave the largest production of total digestible nutrients at the 9-in. spacing. Neither soybeans nor sunflowers produced as much silage as did corn, and their addition to corn did not increase yields. Barley and mixed-grain seedings produced slightly more total digestible nutrients per acre than did oats alone. Oats proved superior to Sudan grass or millet as an emergency hay crop. Hay seedings with spring-grain crops were superior to those with Sudan grass or millet. Clover and timothy seedings averaged 366 lb. more hay the first year and 1,247 lb. more the second year than did clear timothy seedings.

II. *Results of sixteen years of experiments on Honeoye silty clay loam in Monroe County, New York.*—On the Churchville experimental field, a 4-yr. rotation of corn, oats, hay, and wheat received five fertilizer treatments, both with and without manure. On the basis of the rotation as a whole, all fertilizer treatments gave returns above their costs. Complete fertilizer surpassed all other treatments where manure was not used, but it did not always give the largest percentage returns on the investment. The heavier application of superphosphate usually resulted in increased yields and appeared to be more effective when applied with manure. Neither N nor K applied separately, in addition to P, consistently resulted in a profitable increase. When N and K combined were applied in addition to P, values of the crop increases exceeded the additional fertilizer cost, especially on unmanured land. Either N or K applied in addition to P increased the cost of digestible nutrients, and application of both N and K to P produced additional digestible nutrients at about the same cost as P alone.

Corn spaced 3 in. in the row produced more green weight of silage but a smaller amount of digestible nutrients per acre than the 9-in. spacing. Soybeans in rows or drilled yielded less green weight of silage and produced a smaller amount of digestible nutrients than corn alone, and soybeans planted in the row with corn resulted in a slight decrease in production of both silage and digestible nutrients compared with corn alone. Barley made a better average yield than oats and produced more digestible nutrients. Grain mixtures increased the digestible nutrients produced, but the yield of grain from a mixed seeding of oats and barley was less than from oats alone. Compared with a mixture of timothy, red clover, and alsike for 11 yr., alsike alone yielded less, medium red clover about the same, and a combination of alsike and medium red clover produced 442 lb. more hay per acre. For three crops, mammoth red averaged 104 lb. more hay than did medium red clover. Differences in hay yields as the result of the character of the companion crop were not significant.

III. *Results of twenty years of experiments on Volusia silt loam in Cortland County, New York.*—On the Virgil experimental field, the 3-yr. rotation of silage corn, oats, and hay received a number of fertilizer treatments, including manure. Average acre yields on the untreated check were about 3 tons of silage, 20 bu.

of oats, and 0.25 ton of hay. Manure more than doubled the silage yield and increased the oats yield by more than 13 bu. and the hay yield by more than 300 lb. A limestone-superphosphate treatment resulted in yields exceeding State averages, and manure applied with them gave additional increases in yields of all three crops. Superphosphate in addition to manure on unlimed land resulted in increased yields, especially of hay. Potassium chloride applied with limestone and superphosphate on unmanured land was beneficial and profitable, although on manured land it did not on the average increase yields. Average increases in pounds of total digestible nutrients were for each ton of manure 244 lb., and the average annual increases over the check were for lime-P 1,297 lb., lime-P-manure 1,743, P 348, and K 159 lb.

Lime and fertilizers improve pastures, W. R. PERKINS, A. L. GRIZZARD, and T. B. HUTCHESON (*Virginia Sta. Bul. 330 (1941), pp. 32, figs. 7*).—The effects of fertilizers and lime on the yields of pasture herbage and botanical composition were studied, 1930–40, on permanent pastures located on several soil types in Washington County, (southwest) Va.

P gave the largest individual increases in yield of herbage on all soil types of any plant food element studied, and used alone or with K improved decidedly the botanical composition, particularly when N was included in the fertilizer mixture. N used with P or with P and K did not depress the white clover content of the pasture. N in addition to P or P and K gave the most marked early increases in yield of pastures on all soil types studied and also improved the botanical composition of the sod much faster than either P alone or P and K together. K when used with N and P gave an additional marked increase in herbage yield.

Additions of lime increased the yield of herbage decidedly on strongly acid soils but not on moderately acid soils. Lime improved the efficiency of fertilizer treatments on Dunmore clay loam and Elliber and Emory silt loams but not on Pisgah and Dunmore silt loams.

The amount of white clover contained in the pasture the following year was directly related to fall precipitation. Dry autumns were followed by light production of white clover in the next spring. The clover content of the pasture directly influenced the total yield of herbage; in years when clover was abundant, the pasture yield was high, and when clover was absent it was low. The yield of herbage was often doubled by fertilizer treatments where P was applied either with or without N and K, and the treatments also gave grazing from 5 to 12 days earlier in the spring and trebled the carrying capacity of the pasture. Soil type definitely influenced the yield of herbage and also determined to a marked degree the response of pasture soils to lime and fertilizer treatments.

Experiments and observations on pasture management in Appomattox County, T. B. HUTCHESON (*Virginia Sta. Bul. 333 (1941), pp. 32, figs. 10*).—A group of pasture management investigations were made, 1923–40, on Tatum and Cecil soils in Appomattox County in the dark tobacco-producing area. A farming system in which the steeper lands are kept in permanent pastures or meadows and the less erosive lands are cultivated in strip crop rotation seems well adapted to the conditions of the section.

Comparison of different combinations of pasture plants showed that where thin pasture land was properly limed and fertilized, the sod was thickened quickly by seeding grasses and legumes in early spring, but there was no gain from reseeding poor untreated pastures. Annual lespedezas, Italian ryegrass, orchard grass, sheep fescue, redbud, and white clover have been the best plants for such reseeding. Fertilizer, lime, and reseeding tests on land in pasture for 10 yr. or longer demonstrated that old pasture fields of low productivity improve rapidly when limed and fertilized properly. P appears to be the first limiting element

in production. However, N is valuable in increasing the true grasses present in the sod, and later applications of K increase the percentage of legumes and the general vigor of the herbage. Study of effects of lime on reseeded pastures showed it necessary to lime as well as fertilize both new and old pastures in order to establish satisfactory sods on the thin acid soils of this area. Annual lespedezas, preferably in mixtures with true grasses, according to comparative tests, may be used to thicken old pasture sods, but very poor land should be first limed and fertilized. Mixtures of Korean, Kobe, and common lespedezas may provide a longer grazing season than any variety used alone. That sweetclover may be used effectively to improve the grazing capacity of permanent pastures on properly limed and fertilized soils was shown on a 10-acre field reclaimed from pine bushes and gullies by liming, fertilizing, and reseeding. To maintain stands, it appeared necessary to reseed half of the pasture every other year and to keep cattle out of newly seeded fields for at least 4 mo. The newly seeded area is not grazed until August, while the older area is grazed heavily in early spring and summer.

A practical method of making new pastures has been to lime and fertilize the land in the spring and sow to cowpeas or soybeans for grazing or turning under in early fall. The land is then disked and sown to winter oats and proper pasture plants, and the oats grazed off in early summer and use of the land for pasture continued. Reclamation of steep, eroded fields for use as pastures was successfully accomplished by terracing, liming, fertilizing, and seeding to adapted pasture mixtures at a cost of about \$20 per acre. That goats may be used effectively in clearing cut-over land for pastures was demonstrated on 10 acres of land set thickly in a second growth of oak and other hardwood bushes. The areas to be cleared should be burned over after the leaves are out on the trees, and enough goats, two or three per acre under average conditions, should be used to consume the new sprouts as they appear.

A supplemental pasture experiment on poor, run-down land with very acid soil, involving clearing, liming, phosphating, and reseeding, showed the merits of supplemental pastures for producing pasturage in early spring and late fall and lengthening the grazing season. Reserve lespedeza pastures not grazed in mid-summer and seeded to Italian ryegrass in the fall are well adapted for the purpose. An experiment determined the practicability of producing in permanent meadows hay for winter feeding. The results showed that such meadows should be limed, fertilized, and seeded to mixtures of grasses and legumes, e. g., orchard grass, timothy, redtop, red clover, Italian ryegrass, and annual lespedezas. Experiments on effects of fertilized pastures on cattle gains led to the conclusion that liberal fertilization and liming of pastures do not immediately return the cost of treatment in pounds of gain produced on beef cattle, but pay well if residual effects and the increased value of the land are considered over a period of years.

Adaptability of grass species to Arkansas, E. L. NIELSEN. (Coop. U. S. D. A. et al.). (*Arkansas Sta. Bul.* 408 (1941), pp. 62, figs. 14).—The performances of numerous grasses in nurseries at the station, 1937–40, and at substations near Hope, Stuttgart, and Marianna, 1938–40, are shown in tables, with extensive discussion of the location, soil, and climate of each experimental center. Grasses described as appearing to be of agronomic importance in Arkansas, on the basis of growth performance, include crested wheatgrass, redtop, big bluestem, carpet grass, side-oats grama, rescue grass, buffalo grass, Bermuda grass, orchard grass, weeping lovegrass (*Eragrostis curvula*), meadow fescue, Italian and perennial ryegrasses, switchgrass, Dallis grass, reed canary grass, timothy, Kentucky bluegrass, Indian grass (*Sorghastrum nutans*), and prairie cordgrass.

Establishment of Bermuda grass from seed in nurseries, E. L. NIELSEN (*Arkansas Sta. Bul.* 409 (1941), pp. 26, figs. 4).—Date and depth of planting tests

made in small plats in grass nurseries from the last week of March to July 1, 1938-40, inclusive, indicated that seed of Bermuda grass should not be planted before a mean daily temperature of 65° F. is attained. Insufficient moisture or low temperatures retarded seedling emergence and stolon development. Relatively high mean temperatures and enough available moisture favored rapid stolon development. Emergence of seedlings was retarded by heavy rains regardless of prevailing temperatures. Indications were that seed should be covered not deeper than 0.5 in. A series of broadcast plantings on $\frac{1}{400}$ -acre plats paralleled those of the date and depth of planting series in density of turf developed for various planting dates. In developing and maintaining a good turf of Bermuda grass from seed, weed competition appeared to be a limiting factor, whereas winter injury of seedlings was not, providing a reasonably dense turf had developed. Isolated plants, however, were highly susceptible to frost injury, particularly through "heaving."

Germination tests of hulled Bermuda grass seed showed that seed of high viability and purity is available.

The fructosan content of some grasses adapted to Iowa.—A preliminary survey, A. G. NORMAN, C. P. WILSIE, and W. G. GAESSLER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 301-305).—A survey of the fructosan content of certain of the more important grass species adapted to Iowa to ascertain if any might serve as a source of fructose revealed that in almost all samples the content was of the order of from 2 to 4 percent, too low for this purpose. The highest amount found, 7.6 percent, was in Sudan grass at the blooming stage.

Pole-stacks for curing hay in the Upper Peninsula, E. V. MEULEN (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 280-285, figs. 3).—Green hay, a mixture of alfalfa, alsike, and timothy, free from rain or dew, and averaging from 50 to 60 percent internal moisture when polestacked, cured in 14 days under adverse weather conditions to 19 percent moisture with no spoilage, while comparable cocked hay contained 27 percent moisture with a spoilage of 16 percent. A field scale experiment also showed advantages of curing hay in properly made polestacks. Directions and diagrams for constructing polestacks are included.

Range improvement through better varieties of grass is aim of breeding program, W. KELLER (U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 2, pp. 7, 11, figs. 2).—Current activities in the cooperative grass improvement program are reviewed.

Reseeding trials on arid range land, J. O. BRIDGERS (*New Mexico Sta. Bul.* 278 (1941), pp. 48, figs. 9).—The range reseeding trials with grasses, shrubs, and forbs were made, 1935-40, on the New Mexico College ranch near Las Cruces. The area, at an altitude of 4,300 ft., lies within the Lower Sonoran life zone and has a mean annual temperature of about 60° F. and an average annual precipitation of about 9 in. The plats are largely located in a vegetative type dominated by snakeweed (*Gutierrezia* sp.) which has developed from a former grassland type during the last 40 yr., probably due to heavy grazing.

Rothrock grama, blue lovegrass, and Lehmann lovegrass produced good stands from seedlings made during each of 1938, 1939, and 1940. Lehmann lovegrass, an exotic from South Africa and apparently the most promising, seems to be able to establish itself in the area even in years of subnormal precipitation, and it reseeds readily and produces large forage yields. In favorable years Rothrock grama also yields a comparatively large amount of forage and does nearly as well on the ranch as on its native range in southern Arizona. Blue lovegrass has yielded 329 lb. of air-dry forage per acre, lower than the yields of Rothrock grama or Lehmann lovegrass, but comparing favorably with the average production of a good stand of native range grasses. The majority of the 118 other

species of grass tested during the period produced few or no favorable results, although about 30 species were selected for further trial.

Chamiza (E. S. R., 60, p. 36), the only shrub of 29 tested that appeared suitable for reseeding here, gave erratic results, and further research seemed necessary before it may be generally recommended. None of the 23 species of forbs under test proved to be suitable for reseeding. Germination tests showed a high percentage of germination for seeds of many of the southwestern native grasses. Subsequent failure of these seeds to produce stands in the field is due to lack of proper conditions for germination and not to lack of viability. This held for dropseeds, with their poor laboratory germination, and also for black grama, with very high viability.

In tests of seedbed preparation and seeding methods, listing on the contour with a horizontal interval of from 3.5 to 5 ft. appeared the most satisfactory. By using a 2-row lister and trailing a 6-ft. drill to sow the seed, the entire operation could be completed in one trip over the land. Field plantings from 0.25 to 1 in. deep seemed very satisfactory. Reseeding costs per acre, including laying off the contours, seeding, and cost of the seed, may range between \$1 and \$1.50.

Nurse crops not advisable in range reseeding, L. A. STODDART (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 2, pp. 6, 11, fig. 1).—Yields of four grasses were greatly depressed when grown, 1939–40, with rye as a nurse crop at rates of 3, 10, and 25 lb. per acre, compared with grass yields without a nurse crop. While rye has value as a forage and in soil protection, its use as a nurse crop seemed rarely justifiable on arid lands as it uses moisture needed by the grasses.

Alfalfa in Nebraska, H. M. TYSDAL and T. A. KRESSELBACH. (Coop. U. S. D. A.). (*Nebraska Sta. Bul.* 331 (1941), pp. 68, figs. 15).—The more recent information given on the economic importance, production practices, and varietal adaptation of alfalfa, available since earlier publications (E. S. R., 58, p. 132), is based on extensive research at the station and elsewhere and largely noted. Topical discussion is accorded subsoil moisture (E. S. R., 71, p. 765) as a factor, alfalfa in rotations (E. S. R., 71, p. 765), production practices, varieties and regional strains, cutting and haymaking (E. S. R., 65, p. 129), alfalfa as silage and as pasture, seed production (E. S. R., 84, p. 465), diseases, especially bacterial wilt (E. S. R., 69, p. 531), insects, and market grades of alfalfa hay.

Many variety tests have shown wide differences in adaptation of varieties for Nebraska. Southern domestic and foreign alfalfas which are not cold resistant have proved inferior in both stand longevity and yield compared with Nebraska Common, Northern commons, Grimm, Baltic, Cossack, Ladak, and Hardistan. Of the latter, only Hardistan, however, is resistant to bacterial wilt. Cossack, Baltic, Hardigan, Kansas Common, Utah Common, South Dakota Common, German, and Hungarian, as an average of all tests, have equaled or surpassed Grimm in yield, while Orestan, Hardistan, Kaw, and Turkistan have been superior in stand longevity. A long-time stand, if desired under bacterial wilt conditions, may be achieved best with varieties such as Hardistan and Orestan, although lower yields must be anticipated in the early years. When stands of only from 3 to 4 yr. are desired, the first-named varieties can be used. New varieties being developed may combine high yield of seed and forage and ability to maintain stands for a long period. Tests on irrigated farms in the Platte Valley and at North Platte Substation substantiated results at Lincoln in stand survival, except that wilt-susceptible varieties as Grimm, Baltic, and Common succumb more rapidly than at the station, while varieties as Turkistan and Hardistan maintain superior stands. Ladak has proved somewhat intermediate between Turkistan and Grimm in stand survival but has been a good yielder at North Platte. Its relatively high yield in the first cutting makes it also desirable where one cutting during the season is the rule.

Relation of *Lygus* bug damage to alfalfa seed crop failures investigated, J. W. CARLSON. (U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 2, pp. 8-9, figs. 3).—The importance of *Lygus* bugs as a factor in alfalfa seed production is evident from the nature of the damage to buds and flowers, occurrence of these insects in relation to low seed yields and sometimes seed crop failures, and by marked improvement in seed yield resulting when the insects are controlled effectively. The characteristics of the injury and results of a comparative study of growth and development of alfalfa plants infested and not infested by *Lygus* bugs are reported briefly. Entomological phases of the work have been noted (El. S. R., 81, p. 74).

Growing chicory seed, H. L. KOHL and H. C. RATHER (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 243-250, figs. 6).—Cultural and harvest practices and field conditions are suggested for growing chicory seed in Michigan, and brief report is made on experiments of the station on overwintering of plants in the field and on culture, fertilizing, and harvesting of the seed crop.

Wide row spacing and row application of limestone and phosphate for sweet clover production, H. J. HAEFER (*Oklahoma Sta. Bul.* 248 (1941), pp. 29, figs. 8).—Experiments in sweetclover production, 1931-36, largely cooperative with farmers and on different soil types during a period with marked variation in climatic conditions, were concerned with effects of application of limited amounts of finely ground limestone and phosphate in the row with the seed at planting. The limestone and fertilizers were applied in furrows about 3 in. deep and 7 in. apart, and the seed was placed in the soil or scattered on the soil surface above the fertilized zone.

Small quantities of such limestone mixed with rock phosphate or superphosphate and applied with a grain drill equipped with a fertilizer distributor have produced excellent yields of sweetclover on land where very poor growth occurred on unfertilized soil. Rock phosphate and superphosphate drilled in rows at the same acre rate with and without limestone resulted in similar increases in sweetclover yield over unfertilized land. Coarsely ground basic slag was definitely inferior to rock phosphate; finely ground slag had no advantage except on soils with a possible minor element deficiency. Limestone, 400 lb., mixed with 200 lb. of either rock phosphate or superphosphate and applied with a fertilizer grain drill at sweetclover planting produced better yields than half these quantities applied similarly.

Comparison of sweetclover in 42- and 7-in. rows showed that planting in wide rows, fertilized when needed, may improve fertility of poor land, although it is not recommended for most soils which can produce a fair yield of small grain. Root studies indicated that sweetclover in wide rows cultivated to control weeds during the first season will produce a yield of roots similar to that obtained in 7-in. rows. This method of planting has also been effective in western Oklahoma, where the total amount of available soil moisture during an average season is relatively low and available nutrients usually are not limiting factors in plant development.

On eroded areas at Guthrie where Madrid yellow sweetclover was grown in fertilized wide rows, good stands of annual grasses developed. The experiment demonstrated the value of planting sweetclover on the contour in shallow furrows. Evergreen white biennial sweetclover in 7-in. rows produced 6,180 lb. of dry forage per acre, 42-in. rows 6,220 lb., and Madrid yellow in 7-in. rows 4,840 lb. Planting oats between rows of sweetclover has been an effective way to control weeds and grass and also may provide some income during the first year.

The pH value, degree of acidity, easily soluble P, and relative availability of the P in the different surface and subsurface soils on which experiments were located are tabulated and discussed in relation to the growth of sweetclover.

Sweet clover for soil improvement, H. J. HARPER (*Oklahoma Sta. Cir. 94* (1941), pp. 31, figs. 14).—Practical suggestions offered for growing sweetclover to improve soil fertility, for pasturage, and for reestablishing grass on abandoned eroded areas treat of the merits of sweetclover compared to other legumes, soil and fertilizer needs and practices, varieties, seed inoculation, time and methods of planting, nurse crops, and uses of the crop.

Experiments on flue-cured tobacco, E. M. MATTHEWS and T. B. HUTCHESON (*Virginia Sta. Bul. 329* (1941), pp. 30, figs. 9).—Flue-cured tobacco investigations at Chatham, 1927-39, were concerned with soils, rotations, varieties, plant beds, fertilizer formulas, nutrient sources, placement, and split applications, and the relation of spacing and height of topping to fertilizer requirement, yield, and value, and curing. Earlier experiments have been noted (*E. S. R.*, 51, p. 35; 61, p. 638). Conclusions drawn from the research may be summarized as follows:

Flue-cured tobacco thrives on well-drained soils of a structure and texture which provide good aeration and facilitate ease of cultivation, e. g., Durham, Granville, Norfolk, Appling, and deep phase Cecil sandy loams, soils with yellow or light-red subsoils with sufficient slope to drain quickly after rains. Rotations favorable to the production of high-quality leaf should supply a considerable quantity of organic matter to the soil from nonlegumes but omit legumes. Some good type rotations are tobacco, small grains, and grass hay or weeds; tobacco and small grains followed by rye to be turned under; and tobacco continuously with rye as a winter cover crop to be turned under before tobacco.

Varieties of flue-cured tobacco found best are tall-growing kinds adapted to harvesting by the priming method, as Yellow Mammoth, White Stem Orinoco, Yellow Pryor, Virginia Bright, and Gold Dollar. Plant beds should be 6 ft. wide and of any desired length, steam-sterilized or burned, and fertilized with 4-8-3 or similar fertilizer at rates of from 1 to 3 lb. per square yard. For the production of high-quality cigarette tobacco, plants should be spaced from 20 to 24 in. apart in 4-ft. rows and should be topped to leave from 14 to 20 leaves per plant. Except where a high percentage of plug wrappers is desired, best results have been obtained by pulling leaves as they ripen rather than by harvesting by cutting the plant. The use of oil burners for curing flue-cured tobacco has been somewhat more expensive than curing with wood under average Virginia conditions, but temperature may be controlled more easily.

On good tobacco soils, under average conditions, a fertilizer analyzing N 3 percent, phosphoric acid 10, and potash 6, at the rate of 1,000 lb. per acre, is indicated for satisfactory results. The rate may be lowered to 800 lb. per acre on heavier types of soils or the N percentage reduced. The studies of the nutrient carriers suggest that in compounding tobacco fertilizers, from one-fourth to one-third of the N should be derived from organics, one-third from nitrates, and the remainder from standard inorganic sources, the P from superphosphates or other readily available salts and the K from readily available K salts in such proportions as to carry about 2 percent of chlorine. Fertilizers should not be applied to come in direct contact with the plant roots. This may be accomplished by using a machine designed to place the fertilizer in bands on each side of the row, illustrated by tests in cooperation with F. H. Bateman, or by running a wide single-shovel plow through the fertilizer drilled in the row, before listing or bedding the land. N or K in addition to that recommended for use at planting, if needed, should be applied as side dressings at the first or second cultivation.

Weeds of Colorado, B. J. THORNTON and L. W. DURELL (*Colorado Sta. Bul. 466* (1941), pp. 125, figs. 133).—A revision and enlargement of Bulletin 408 (*E. S. R.*, 71, p. 41).

Control of lawn weeds and the renovation of lawns, F. A. WELTON and J. O. CARROLL (*Ohio Sta. Bul. 619* (1941), pp. [1]-85, figs. 50).—Characteristics and

control measures for 26 species of weeds infesting lawns and in waste places near lawns are described from extensive studies during 1923-40 on their elimination with chemicals and in certain cases by cultural practices and weed seed control. An earlier publication (E. S. R., 84, p. 323) considered the building and maintenance of lawns.

Dandelions were killed in one season without serious permanent injury to grass by dusting with ammonium sulfate 6 lb. per 1,000 sq. ft. at 2-week intervals beginning in May when or a little before they came into bloom. A total of from 8 to 10 applications were made. Sodium nitrate and several other nitrogenous fertilizers could replace ammonium sulfate. Other chemicals killing dandelions included arsenic pentoxide, ammonium thiocyanate, iron sulfate, and sodium chlorate. Unless dandelions are small, cutting off roots shallower than 4 or 5 in. is usually ineffective. Cutting off roots in May was better than cutting in September or October. Since reserves were lowest in late April or early May, treatments intended to exhaust plants should begin at that time. Recommendations of other workers are noted. Broad-leaved plantain was eliminated by the same materials, applied likewise, as for dandelion.

For buckhorn (narrow-leaved plantain), Nitrophoska, Ammo-Phos A, and a mixture of ammonium and iron sulfates at the rates indicated were the most satisfactory of the chemicals tested, and reseeding was not needed after their use. Results from chemical treatments were disappointing, however, because new plants soon came in from seed. Data are included on vegetative reproduction, seed production and longevity, rate of growth of seed stalk, and behavior of the plant as a short-lived perennial. Buckhorn was found less winter hardy than bluegrass, dying at a soil temperature of 10.4° F., and correspondence with agricultural institutions in northern latitudes revealed that buckhorn is not a serious problem in those regions.

Crabgrass was killed by six weekly applications of a 0.5-percent solution of sodium chlorate at the rate of 10 gal. per 1,000 sq. ft. begun June 19, when seedlings had only one or two leaves. The period of discoloration of the lawngrass was shortened by deferring treatment until late August or September 1, when two applications of a 1-percent solution a week apart or one application of a 2-percent solution was needed. Crabgrass also has been killed by shading with black garden mulch paper for 10 days and was controlled up to 95 percent by lead arsenate. Other practices favoring suppression of this weed were raking and cross-mowing in late summer and clipping grass at 2-in. height, especially when combined with fertilization.

Sodium chlorate when applied in the solutions and rates indicated under the particular species was (like the chemicals and practices noted in parenthesis) useful in controlling the following weeds with more or less injury to the grass: Ground-ivy, thyme-leaved speedwell, common chickweed, mouse-ear chickweed (ammonium sulfate dust), heal-all (iron sulfate solution), milk purslane, creeping buttercup (ammonium thiocyanate solution), moneywort (sodium chloride solution), sheep sorrel (iron sulfate solution), doorweed (ammonium thiocyanate solution and Cyanamid), and quackgrass (shading and Cyanamid). Sodium chlorate also was effective on weeds in waste places adjacent to lawns, e. g., round-leaved mallow, tall nettle, wild carrot, pokeweed and yellow dock (spudding), burdock (mowing and spudding), and poison-ivy. Yarrow could be eliminated by liberal and systematic fertilization with ammonium phosphate or Nitrophoska, orchard grass by top dressing with Cyanamid, white clover by top dressing with ammonium sulfate or other nitrogenous fertilizer, and moss by improvement of drainage, thinning out of shade, and fertilization with Kainit, Nitrophoska, and other materials.

Weed seed studies showed the merits of chloropicrin for killing weed seeds in composts or wood soils for use as top dressing for turf, without adverse effects on the soil, and increased growth of grass; Cyanamid in control of certain lawn weed seeds on lawn areas; and the effectiveness of Sinox in killing weed seeds in from one to three sprayings and as a weed killer.

Lawn weeds and their control, D. C. TRINGEY and B. MAGUIRE (*Utah Sta. Cir. 117 (1941), pp. 14, figs. 7*).—Methods outlined for control of lawn weeds comprise the management practices of fertilization, mowing, and watering, and measures such as digging, pulling and raking, chemicals, and burning. Dandelion, chickweed, plantains, smooth crabgrass, annual bluegrass, and Bermuda grass, the worst lawn weeds in Utah, are described and illustrated, and 18 secondary species are listed.

Plot tests with chemical soil sterilants in California, A. S. CRAFTS, H. D. BRUCE, and R. N. RAYNOR (*California Sta. Bul. 648 (1941), pp. 25, figs. 16*).—Typical herbicidal behavior of sodium arsenite, arsenic trioxide, sodium chlorate, ammonium thiocyanate, borax, and colemanite toward annuals and certain perennials and suggested dosages in pounds per square rod found necessary for soil sterilization in practical weed control are described from analyses of more than 1,200 cooperative plot tests made on 13 soils during 8 yr. Other contributions in this weed control program have been noted (*E. S. R.*, 75, p. 482; 77, pp. 310, 331; 81, pp. 344, 345, 511).

Sodium arsenite solution, rapid in its toxic action, decreases in effectiveness only slowly over a period of years; an application equivalent to 5 lb. of As_2O_3 per square rod may kill, on an average, 95 percent of annual growth the first year and 80 in the fifth year. It is less effective on perennials, but applications equal to 10 lb. or more of As_2O_3 per square rod usually will kill nearly all shallow-rooted species. Arsenic trioxide applied dry is not highly effective the first year, but thereafter it is even more potent than sodium arsenite against annuals. Without distinction as to soil and species, 5 lb. of arsenic trioxide distributed uniformly over 1 sq. rod will normally kill about 95 percent of annual vegetation from the second to the sixth year. It has practically no effect on most perennials. Sodium chlorate acts through the soil and is very poisonous to both annuals and perennials; it is very soluble and is readily leached. For best success the rainfall between the application of chlorate and the season of active root absorption should be considered. The depth of penetration of the chlorate into the soil should coincide with the depth of the main root system at the time of maximum root activity in the spring. Sodium chlorate added to arsenic trioxide or to sodium arsenite combines its rapid action with their lasting properties. Since chlorate acts on deep-rooted perennials, the mixture offers an effective treatment where both deep- and shallow-rooted plants abound.

Ammonium thiocyanate is very soluble, like sodium chlorate, but seems to possess less inherent toxicity. It also decomposes rapidly in the soil (*E. S. R.*, 82, p. 331) and has been observed to stimulate weed growth. Borax and colemanite have more lasting effects than chlorate but less than arsenic. They do not possess the high inherent toxicity of these other herbicides yet have proved successful against Klamath weed and bearcoat, and being nonpoisonous to livestock, may be used without hazard on ranges.

The test plot observations substantiated greenhouse and laboratory results in showing that inherent toxicity of the chemical, colloidal adsorption of the chemical by the soil, decomposition of the chemical, removal by leaching, salt content of the soil, and tolerance or physiological resistance of various weed species to toxic chemicals are variables pertaining to chemical weed control.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1940, pp. 18-19, 63-77, fig. 1*).—Included are progress reports on studies of fertilizers for lettuce, lettuce seed storage, cantaloup breeding, lettuce breeding, factors involved in grapefruit maturity, winter temperatures in the Salt River Valley citrus groves, fertilizers for grapefruit, relation of fertilizers and cultural practices to the quality and yield of grapefruit, nitrogen uptake by citrus trees, varietal tolerance of pecans to warm winter temperatures, factors underlying pecan nut filling and maturity, methods of breaking the winter rest period in pecans, pistillate blossoming and pollen distribution in the pecan, effect of nitrogen fertilizers and zinc amendments on the rosetting of young pecan trees, behavior of date varieties in the 1939 season, date maturation and storage, behavior of dates in 1940 in the Tempe and Yuma gardens, and the testing of peach varieties and miscellaneous fruits.

[Horticultural studies by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1940, pp. 80-94, 94-96, 97-99, 101-102, 103-104, 145-146, 152-157, 163-166, 169-170, 175, 176, 198-201, 201-203, 204, figs. 12*).—Included are progress reports on the following studies, by G. H. Blackmon, R. D. Dickey, R. J. Wilmot, F. S. Jamison, V. F. Nettles, A. L. Stahl, J. C. Cain, F. S. Lagnasse, H. M. Sell, R. W. Ruprecht, J. R. Beckenbach, D. G. A. Kelbert, J. H. Jefferies, A. F. Camp, W. W. Lawless, B. R. Fudge, G. B. Fehmerling, L. H. Greathouse, F. F. Cowart, G. R. Townsend, F. S. Andrews, W. T. Forsee, J. R. Neller, S. J. Lynch, and W. M. Fifield: Fertilizer, culture, and varieties of pecans; propagation, planting, and fertilizing tung oil trees; testing and propagation of rose, iris, and abelia; cover crops for the pecan; fertilizer requirements of truck crops; relation of nitrogen absorption and storage to growth and reproduction in pecans; varieties of peaches and May haws; preservation of citrus juices and pulps; storage and preservation of miscellaneous fruits and vegetables; cold storage of citrus fruits; chemical and physical changes associated with the ripening of citrus fruits; relation of soil reaction to growth and yield of vegetable crops; testing of varieties and strains of vegetables for commercial use; effect of green manures on growth, yield, and quality of vegetables; fumigation of narcissus bulbs and tobacco plants; effects of mineral deficiencies on the adaptability of cabbage and sweetpotatoes; selection of tung oil trees for productivity and oil content of nuts; soil and fertilizer requirements of celery; and strains of and fertilizers for lettuce.

Studies at the Bradenton Vegetable Crops Laboratory include relation of temperature and time of planting to head production in lettuce.

Work at the Citrus Substation includes studies of citrus progeny and bud selection, varieties and breeding of citrus fruits, effect of nutrient deficiencies on low-temperature injury, physiology of citrus nutrition, effect of nutrients on citrus fruit quality, effect of wax treatments on the storage of citrus fruit, and factors affecting the quality of fruit juices.

At the Everglades Substation fruit and forest trees and other introductions were tested, and greenhouse investigations continued on the effect of soil applications of copper sulfate.

Studies at the Subtropical Substation include rootstock and variety tests with citrus, varieties and culture of avocados, improvement of tomatoes by selection of new hybrids, testing of minor fruits and ornamentals, and varietal tests of lettuce.

[Horticultural studies by the Maine Station] (*Maine Sta. Bul. 400 (1940), pp. 185-188, 194-203, 206-207, 208, 274-276*).—Among the studies discussed are

those by R. M. Bailey, I. M. Burgess, M. T. Hilborn, D. S. Fink, J. A. Chucka, S. M. Raleigh, F. B. Chandler, and I. C. Mason on apple breeding; fruit thinning of Golden Delicious apples; factors, such as stock-scion relationships, involved in winter injury to apple trees; apple fertilizers; sweet corn breeding, spacing, varieties, and fertilizers; planting rates for snap beans; effect of frequency of harvest on yield and grade of snap beans; effect of nitrate of soda on snap beans; breeding of beans; effect of time of planting on tomato yields; tomato breeding; breeding cucumbers resistant to scab; seed treatment of spinach; strawberry and blueberry breeding; the burning of blueberry fields; and chemical analyses of blueberry fruits.

Mushroom growing in the United States, E. B. LAMBERT (*U. S. Dept. Agr., Farmers' Bul. 1875 (1941), pp. [2]+38, figs. 19*).—In this revision of Circular 251 (El. S. R., 68, p. 761) and Farmers' Bulletin 1587 (El. S. R., 61, p. 140), information is presented on various phases of production, including the construction of houses and beds, the use of cellars, preparation of natural and synthetic composts, pasteurization of beds, environmental factors in the growing rooms, control of disease and insect pests, harvesting, marketing, etc.

Studies on the preparation of mushroom compost, E. B. LAMBERT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 7, pp. 415-422, figs. 3*).—The effect of variations in temperature and aeration in compost heaps on the growth of mushroom mycelium was determined by inoculating samples of manure with mushroom spawn and growing it at 70° F. in competition with weed molds present in the compost. Under aerobiosis, fermentation at 120°-140° for 8-10 days produced suitable compost. Temperatures over 150° for a few hours rendered the compost unsuitable, as did anaerobic fermentation, even at favorable temperatures. Composted under different combinations and sequences of these conditions, manure tended to assume characteristics typical of the environment to which it was last submitted.

Factors affecting onion pungency, H. PLATENIUS and J. E. KNOTT. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 6, pp. 371-379*).—Measuring pungency on the basis of chemical determinations of the volatile-sulfur content of the bulb, it was found that certain onion varieties contained nearly three times as much volatile sulfur as others. On a dry-weight basis the differences were much less, suggesting that to some extent relative pungency is merely a question of concentration of dry matter. Studies of the effect of growing temperatures on pungency showed a tendency toward increase as the average temperature increased. Next to variety the type of soil on which onions were grown was the most potent factor influencing pungency. For example, onions produced on peat soil were relatively twice as pungent as those of the same variety grown on sandy soil. There was a direct but not proportional correlation between the volatile-sulfur content of onions and the total sulfur content of the soil on which they were grown. Overhead irrigation or a high water table resulted always in a small but consistent lowering of the volatile-sulfur content of the bulbs, and this was associated with a pronounced increase in the size of the bulbs grown with an abundant supply of moisture. In cold storage there was a slow increase in pungency, explained in part by the loss of water and carbohydrates as a result of transpiration and respiration.

The effect of aeration on growth of the tomato in nutrient solution, W. D. DURELL (*Plant Physiol., 16 (1941), No. 2, pp. 327-341, figs. 9*).—Aeration of the nutrient solution was found to have a beneficial effect on the production of fruit as well as the development of roots, stems, and leaves. Aeration by natural diffusion of the air had no significant effect on total fruit production or upon the speed of ripe fruit production except in the early stages of growth. The optimum aeration of the nutrient medium as measured by fruit production and root

development was attained by artificially supplying 2.5 cc. of air per plant per minute. Stem and leaf production were found proportional to the rate of aeration, the greatest production being reached with a supply of 250 cc. of air per plant per minute.

Records on a full crop yield of apple varieties topworked on various hardy stocks, T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 345-347).—Records taken on the yield of a number of varieties of apples limb-budded in August 1925 on Hibernial and Virginia Crab trees showed that varieties on Virginia Crab have greatly outyielded the same kinds on Hibernial. Varieties differed in their productivity, largely because of more regular production in some. Observations on Jonathan trees worked on Hibernial, Virginia Crab, Dudley, and certain other stocks showed the stock to have a pronounced effect on yields. For example, Jonathan on 4-7-16, an open-pollinated seedling of Canada Baldwin, yielded far more fruit (1938-40) than on any other rootstock. The author points out that there is manifestly a need for more exact information on stock-variety combinations.

A response of apple trees to potash in the Champlain Valley of New York, A. B. BURRELL and J. C. CAIN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 1-7).—The application of K to McIntosh trees about 10 yr. of age and exhibiting weak growth, scorched leaves, and limited fruit production failed to give any result the year of treatment. By July of the next year there was improved growth, better color of the leaves, and conspicuously less scorch. The K content of the leaves of the treated trees was increased greatly. Certain limbs failed to respond, suggesting that they were probably so badly injured that their capacity to recover was lost.

In another experiment, the response to K was also slow but was finally indicated in improved fruit size and color and almost complete disappearance of scorch. The results, although not sufficiently clear-cut to justify recommendations, suggest the need of further experimentation with K fertilizers, particularly on younger trees.

A comparative study of storage at 32° and 36° F. of apples grown in the Potomac River Valley, M. H. HALLER and J. M. LUTZ (*U. S. Dept. Agr., Tech. Bul.* 776 (1941), pp. 42, figs. 2).—Records taken during 3 seasons on 13 varieties stored at 32° and 36° showed individual varieties to vary somewhat in their response to temperature, but with nearly all 32° was preferable for long periods of storage. Grimes Golden was an exception, giving better results at 36°. The average percentage of decay in fruits that developed appreciable amounts was nearly 50 percent greater following storage at 36° than at 32°. There was some evidence that scald appeared earlier at 36° than at 32°, but it eventually developed equally severely at 32°. In Arkansas and Stayman Winesap internal break-down was more severe at 36°. There was a more rapid change in the ground color from green toward yellow at 36° than at 32°. A gradual loss in dessert quality during storage was generally more rapid at 36°.

Origin and evolution of the cultivated pear, G. A. RUSTSOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 28 (1940), No. 4, pp. 350-353).—In this discussion of the origin of the pear, the author suggests the probability that other species than *Pyrus communis* have entered into the heredity. For example, he indicates that in varieties such as Orpha (pussy willow pear) some other species must have supplied the genes for the long, lanceolate leaves. It is suggested that the ancestors of the cultivated pear may be found in the mountainous regions of the Caucasus, Anatolia (Asia Minor), and central Asia.

Peach culture in Michigan, S. JOENSTON (*Michigan Sta. Cir.* 177 (1941), pp. 86, pls. 4, figs. 56).—With a chapter on peach insects by R. HURSON and one on peach diseases by D. CATION, this paper presents general information on the

history of peach growing in Michigan, on varieties, locating of orchards, methods of planting, cultural care, pruning, training, winter protection, fruit thinning, harvesting, marketing, and related topics.

Results of strawberry plant spacing experiments, R. E. LORIE (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 251-253).—A comparison of various planting systems with the five varieties, Howard 17, Dunlap, Fairfax, Dorsett, and Catskill, showed in general that the spaced plants were most productive of marketable fruit. There was some difference in the response of the several varieties. With varieties such as Dorsett, Fairfax, and Catskill, which naturally produce large crowns, a 6- to 8-in. spacing appeared desirable. For Dunlap with smaller crowns, a 4-in. spacing may suffice. Because of the added cost, spacing may not be feasible on a large-scale basis, but a type of culture is discussed which will tend to separate the plants.

Growing bush fruits in Kansas, G. A. FILINGER (*Kansas Sta. Cir.* 204 (1941), pp. 31, figs. 20).—Information is presented on varieties, culture, pruning, propagation, winter protection, control of pests, etc.

Botanical and economic distribution of *Vaccinium* L. in Maine, F. B. CHANDLER and F. HYLAND. (Maine Expt. Sta. and Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 430-433, figs. 3).—Stating that 10 of the 130 species of *Vaccinium* occur in Maine and that 8 of these are of some economic importance, the authors discuss the distribution and significance of the several edible species, including highbush and lowbush blueberries, trailing cranberries, and the mountain cranberry.

Selection of the low-bush blueberry in West Virginia, W. H. DUIS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 434-437).—Discussing the occurrence, distribution, and variability of lowbush blueberries, the author states that some work has been done in West Virginia in selecting desirable types from *Vaccinium angustifolium* and *V. pallidum*.

Seed size in blueberry and related species, G. M. DARROW. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 438-440).—Using only fully developed seeds, a well-defined difference in the weight of 100 seed samples of various species and varieties of *Vaccinium* and related genera was recorded. For example, in named varieties of *V. corymbosum* the range was from 37 mg. in one case to 61 mg. in another. In general, diploid and tetraploid species and varieties had smaller seeds than did hexaploid forms. Ruby, a variety of *V. virgatum*, hexaploid, had the largest seeds of any blueberry tested. Hybrid seed of Dixi was larger in most instances than was open-pollinated seed of the same variety.

Effect of some nutrients, media, and growth substances on the growth of the Cabot blueberry, A. KRAMER and A. L. SCHRAEDER. (Univ. Md. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 437).—Observations on rooted cuttings grown in peat-sand and sand media supplied with various nutrient solutions and growth substances showed that the shoot:root ratio of plants growing in the peat-sand medium was greatly increased when Mn, Fe, Ca, B, or Mg was omitted and decreased when S, B, P, or N was withheld from the sand-grown plants. Deficiency symptoms appeared in the following order: N, K, S, Ca, B, Mg, P, Fe, and Mn. It is suggested that the beneficial effect of peat was due partly to its content of Ca, S, and B in available form and partly to unknown factors. Nutrients had a significant effect on the rapidity with which terminal growing points aborted. A significant correlation was established between the percentage of terminals aborted and top weight. Weekly applications of thiourea and vitamin B₁ had no significant effect on deficiency symptoms, fresh or dry weights, or growing point abortion.

Grafted grapes in Missouri, P. H. SHEPARD (*Missouri Fruit Sta. Bul.* 30 (1941), pp. 22, figs. 8).—Varieties, such as Concord, Moore Early, Campbell Early,

Delaware, Sheridan, and Ellen Scott were grown on their own roots and on different rootstocks. Campbell Early on the most effective rootstock produced four times as much fruit as on its own roots. Other varieties, such as Moore Early and Concord, did not respond as markedly in fruit but made much greater vine growth, which should mean increased yields in later years. Constantia, a probable *Vitis vulpina* \times *V. rupestris* cross, proved to be an outstanding stock for several varieties. Another promising stock was U. S. D. A. 125-1, giving the best results with Moore Early and second best with Delaware and Campbell Early. No appreciable difference in quality of fruit or in time of ripening was recorded.

Grape production in eastern New Mexico, D. R. BURNHAM. (Coop. U. S. D. A.). (*New Mexico Sta. Bul.* 275 (1941), pp. 23, figs. 8).—In connection with general information on planting, training and pruning, culture, protection from pests, and varieties, information is given on the annual and average yield of over 20 varieties of grapes grown at the Tucumcari Field Station, 1926-40.

Growth of young orange trees as influenced by organic matter and root-growth promoting substances, E. R. PARKER, F. M. TURRELL, and J. BONNER. (Calif. Citrus Expt. Sta. et al.). (*Calif. Citrog.*, 26 (1941), No. 6, pp. 151, 168-169, figs. 6).—Valencia orange trees propagated on apogamic sweet orange seedlings were supplied with various soil additions, including moistened imported sphagnum peat moss, local sedge peat, and dairy manure, applied in basins to the newly planted trees or mixed with the soil at planting. In addition, other trees were supplied with vitamin B₁ and nicotinic acid in dilute solutions. The growth of all trees, controls and treated, was excellent. Trunk measurements showed no significant difference between trees treated with organic materials and the controls, nor did vitamin B₁ used alone or in combination with nicotinic acid have any material effect. Using the *Phycomyces* test, vitamin B₁ assays were made of leaves, with no evidence of significant variation. Apparently normal Valencia orange trees synthesize sufficient vitamin B₁ and nicotinic acid to meet their requirements.

Citrus varieties for the lower Rio Grande Valley, W. H. FRIEND and J. F. WOOD (*Texas Sta. Bul.* 601 (1941), pp. 36).—Stating that the important varieties of citrus in the Rio Grande Valley include the Ruby and Marsh grapefruit, Hamlin and Valencia oranges, Clemantine tangerine, Meyer and Eureka lemons, and the Mexican lime, the authors present information on the yield and fruit characteristics of a large number of citrus varieties which have been tested at the Westlaco Substation. However, it is recommended that for commercial production the grower confine himself to a few varieties known to be popular with shippers and handlers of citrus fruit.

Unequal distribution of soluble solids in the pulp of citrus fruits, E. T. BARTHOLOMEW and W. B. SINCLAIR. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 293-312, figs. 6).—Mature oranges and grapefruit were found to have a considerably higher concentration of soluble solids in their styler than in their stem halves. In immature fruits the content may be equal in both halves or there may be a higher concentration in the stem half, suggesting why the styler portion may be injured by low temperature when the stem half is unharmed. The concentration of total soluble solids in the segments of a given fruit may vary greatly, especially in mature fruits. Of 130 fruits examined, 87 percent had a higher concentration of total solids in their three north than in their three south segments, irrespective of position on the tree, provided the fruits were exposed, outside ones. The total soluble solids content of the expressed juices, as determined by the refractometer, appeared to be a reliable index of the temperature at which such juices will freeze. In the fruits studied, color of the juice was not uniform in all the segments, nor was color always the same in the stem and styler halves of the segments.

Azaleas, J. G. WEAVER (*N. C. Agr. Col. Ext. Cir. 246 (1941), pp. 24, figs. 11*).—This is a presentation of general information on types, varieties, propagation, culture, etc.

Effect of cool storage of Easter lily bulbs on subsequent forcing performance, P. BRIERLEY. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 6, pp. 317-335, figs. 5*).—Using chiefly bulbs of the Creole variety, it was found that storage in dry sand at 32° F. kept the bulbs with less deleterious effects on forcing quality than did 40° or 50°. Storage for 10 weeks or more at 50° was distinctly harmful, reducing both the number of flowers and the number of leaves per plant. Storage for 5 weeks or more at from 32° to 50° accelerated flowering, with the higher temperatures having the greater effect. Bulbs stored in moistened peat moss flowered slightly in advance of those held in dry soil or sand. After 45 weeks at 32° the quality was barely acceptable, and after 60 weeks the average performance of 7- to 9-in. bulbs was poor. The effect of low-temperature storage on the time required for the bulbs to emerge from the soil and on the height of the plant were less consistently evident, but when differences were shown they were in the direction of a decline from the level of control plants, the bulbs of which had not been subjected to storage. Size of flowers was little influenced by storage of the bulbs. Cool storage of bulbs is considered to be a convenient primary control over time of flowering, with indications that new crop bulbs of early varieties can be forced for Christmas by suitable combinations of early harvest and cool storage.

An illustrated guide to care of ornamental trees and shrubs, F. S. BARSON and R. O. MONOSMITH (*Mississippi Sta. Bul. 354 (1941), pp. [1]+56+[1], figs. 54*).—This bulletin contains general information on planting, culture, pruning, control of insect and disease pests, etc.

A new method of plant propagation, P. P. PRONE. (N. J. Expt. Stas.). (*Science, 94 (1941), No. 2429, p. 74*).—Successful rooting was obtained with a considerable number of ornamental species, the cuttings of which were suspended in a chamber with a glass front and back and in which a very high relative humidity was maintained by means of strips of absorbent cloth suspended in a water trough. The type of box is tentatively called the Rutgers Aero-propagator. Among plants giving good results within 3 weeks were the begonia, chrysanthemum, coleus, geranium, perennial phlox, and ivy. With more time, good results were obtained with dormant cuttings of species of hydrangea, deutzia, and mockorange.

House plants, F. L. MULFORD (*U. S. Dept. Agr., Farmers' Bul. 1872 (1941), pp. II+30, figs. 10*).—General information is presented on types, culture, propagation, and handling of house plants, supplemented with a brief discussion of the control of diseases and insects.

FORESTRY

New forest frontiers for jobs, permanent communities, a stronger Nation (*U. S. Dept. Agr., Misc. Pub. 414 (1941), pp. [1]+76, figs. 82*).—This profusely illustrated pamphlet depicts the situation on neglected and abandoned forest lands, indicates what has been done in certain localities to improve the situation, and shows what well-managed forests might do to prevent erosion, maintain water supplies, support wildlife, and provide profitable work and healthful recreational facilities for American people.

Forest studies of Logan Grove, Geary County, Kansas, L. F. SMITH. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 43 (1940), pp. 177-183, figs. 2*).—In connection with historical notes, data are presented on the species composition, size of trees, rates of growth, reproduction, etc.

Practical forest management for the cut-over hardwood lands in southern West Virginia. L. BESLEY (*West Virginia Sta. Bul. 300 (1941), pp. 15+xlvi*).—Covering a study of private forest lands in several counties, this paper reports that the average stand is growing at the rate of 40 mine props per acre per year. In the two best forest types, which occupy over one-half the area, the growth is about 50 mine props per year. With the exclusion of fire, the probable yield per acre over a 20-yr. period would total 1,000 mine props. By leaving on each acre from 10 to 12 thrifty hardwoods, such as red oak, sugar maple, and tulip poplar, a limited amount of saw timber might be produced without reducing materially the crop of mine props. The data are analyzed separately for the different forest types, cut-over and old-growth stands, and in two of the types by exposures. Certain practical measures, such as fire exclusion and the removal of defective trees, are suggested for the improvement of existing stands.

An example of timber management in the Southwest. G. A. PEARSON and F. H. WADSWORTH. (U. S. D. A.). (*Jour. Forestry, 39 (1941), No. 5, pp. 434-452, figs. 9*).—An account is given of stand changes, increment, mortality, and natural regeneration on an area of 480 acres near Flagstaff, Ariz., and logged by the Forest Service in 1909 and again in 1939. All trees 4 in. or more in diameter at breast height were measured at 5-yr. intervals. The volume per acre after the initial cutting was 3,542 bd. ft., and after the second cutting the residual volume averaged 2,995 bd. ft. Mean annual net increment during the 30 yr. averaged 81 bd. ft., and mortality 21 bd. ft. per acre. Gross increment rose to 184 bd. ft. during the first decade, and then declined steadily to 85 bd. ft. in the last 5-yr. period. Mortality rose from 11 bd. ft. in the first 5 yr. to 36 in the last. Good reproduction followed cuttings. The land had returned a net annual income of 14 ct. per acre above the estimated cost of protection and administration. Since this yield is largely that of low-grade trees occupying less than one-half of the land, much higher yields might be expected under more favorable conditions.

Kiln design and development of schedules for extracting seed from cones. R. C. RIETZ. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Tech. Bul. 773 (1941), pp. 70, figs. 45*).—Steam-heated dry kilns having forced-air circulation and temperature control were designed and used for efficiently drying relatively moist cones without danger of seed injury. A constant temperature of 115° F. is recommended for kiln drying longleaf pine cones, 140° for eastern white pine, 160° for red pine, and 170° for jack pine. Tray storage of red pine cones prior to kiln drying was more satisfactory than sack storage.

Natural regeneration in the western white pine type. I. T. HARR, K. P. DAVIS, and R. H. WEDMAN (*U. S. Dept. Agr., Tech. Bul. 767 (1941), pp. [2]+99, pls. 12, figs. 11*).—This publication assembles the available information on natural regeneration of the western white pine type centering in northern Idaho, resulting from 25 yr. of forest research and 30 yr. of national-forest-cutting experience. The character and composition of the forest, and its susceptibility to injury by fire, disease, insects, snow, and wind, are described, particularly as they affect natural regeneration. Extensive information on factors affecting seed supply, initial establishment, and early development of western white pine and its principal associates is given. This body of information is applied in a critical analysis of the advantages and disadvantages of regeneration methods applicable in the region. Clear-cutting, seed-tree, and shelterwood methods were all found to have a permanent place, with the latter probably the most generally applicable. The selection method has very limited application.

Loblolly pine establishment as affected by grazing, overstory, and seed-bed preparation, E. W. GEMMER. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 5, pp. 473-477).—In a study started in 1938 on the Crossett Experimental Forest in Arkansas, it was observed that loosening of the mineral soil through cultivation or exposing the surface by raking, increased materially the number of germinating seeds. Cultivation was more effective than raking, with definitely more seedlings present at the end of the first growing season. Grazing by cattle reduced the number of germinating pines by almost one-half. The influence of overstory was less clear, with the best germination occurring under the heaviest and lightest stand densities.

The period of seasonal growth of ponderosa pine and associated species, H. A. FOWELLS. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry*, 39 (1941), No. 7, pp. 601-608, figs. 4).—Measurements over an 8-yr. period of the seasonal growth of six coniferous species at one location showed considerable differences in the time that the several species began growth, the length of the growing period, and the minimum number of days required to complete 50 percent of the growth. The first species to start was lodgepole pine and the last was white fir. White fir had the shortest and California incense-cedar the longest growing period. Sugar pine required the least and incense-cedar the most time to complete 50 percent of their growth. A comparison of the seasonal radial growth of four species, ponderosa pine, sugar pine, incense-cedar, and white fir, showed that the white fir was last to start development and had the shortest growing period.

Observations on ponderosa pine at five elevations showed height growth to start significantly later with each 2,000-ft. rise in altitude. Length of the growing period was shortened significantly with an increase of 3,000 ft. in elevation. Radial growth started significantly later with an increase of 2,000 ft. The rate of height and radial growth of ponderosa pine during the grand period of growth was not influenced by elevation. Needles of the pines did not emerge from the fascicle sheath until 50 percent or more of the growth had occurred.

Tolerance of shortleaf pine seedlings for some variations in soluble calcium and H-ion concentration, A. G. CHAPMAN. (U. S. D. A.). (*Plant Physiol.*, 16 (1941), No. 2, pp. 313-326, figs. 5).—Studies with shortleaf pine (*Pinus echinata*), a species limited in its natural distribution to low-Ca, acid soils, showed that germinating seed and young seedlings cannot survive in culture media having a soluble-Ca content of approximately 500 p. p. m. or more and a pH value of approximately 6.5 or more or having either of these characteristics. The osmotic pressures of the cultural solutions and a solution of the alkaline nursery soil were not high enough to bring about plasmolysis of the seedling root cells. Expressed sap of the roots of seedlings a few weeks old was more highly buffered against acid than against alkali. Sap from roots developed in an acid soil was more highly buffered against alkali than was that from roots developed in an alkaline soil. Buffering of the cell sap of roots may be somewhat increased by applying P to soils deficient in P. The pH values of expressed root saps were lower in all cases than those of the soil media in which the roots have grown. High-Ca content of the soil may prevent natural reproduction of planted shortleaf pine stands, increase the cost of soil management in nurseries, and render inapplicable the results of germination tests.

The root system of red pine saplings, M. W. DAY. (Mich. Expt. Sta.). (*Jour. Forestry*, 39 (1941), No. 5, pp. 468-472, figs. 6).—The root systems of five trees, three on the Dunbar Forestry Substation and two nearby, were studied.

The trees ranged in height from 5.3 to 11 ft. and in age from 12 to 14 yr. The roots were found to consist of a well-developed lateral system with both ascending and descending branch roots which often assumed major importance. In only one instance did the taproot assume major significance. Variations in site produced apparently striking effects on the roots. Trees on lighter soil and drier situations developed the more extensive root systems and the more deeply descending sinker roots. Lateral roots were found within 1 ft. of the surface, and only the vertical roots went deeper.

An effect of drought on white pine, F. C. CRAIGHEAD. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 7, pp. 618-619).—Unusually short needles and terminals observed in the 1935 and 1936 growth of white pine (*Pinus strobus*) could not be associated with insects or fungi and were attributed to drought alone. The author suggests that droughts during late spring at the time new growth is forming are particularly critical if there is an accumulated deficiency in soil moisture.

Deficiency symptoms for the major elements in seedlings of three broad leaved trees, C. L. WORLEY, H. R. LESSELBAUM, and T. M. MATTHEWS. (Univ. Ga.). (*Jour. Tenn. Acad. Sci.*, 16 (1941), No. 2, pp. 239-247).—Using sand cultures, there were observed considerable differences in the responses of three species, *Ulmus pumila*, *Ailanthus altissima* (= *A. granulosa*), and *Catalpa speciosa*, to different deficiencies in the nutrient solutions. Weight and top: root ratios for the elm were frequently in the opposite direction to those for the catalpa, and in *Ailanthus* were usually of lesser magnitude than in the other two species. The use of Zn, Cu, and Mn, elements which exert their influences primarily through the photosynthetic processes, affected the three species differently.

Changes in chemical composition of twigs and buds of yellow poplar during the dormant period, J. J. McDERMOTT (*Plant Physiol.*, 16 (1941), No. 2, pp. 415-418, figs. 2).—An apparent decrease in total N in the buds and twigs of the yellow poplar during winter and during the breaking of dormancy was noted. In February and early March much of the protein was converted into more soluble compounds which were resynthesized into insoluble forms, probably proteins for the production of new protoplasm in the expanding buds. Of the carbohydrates, starch and the sugars were most readily used in respiration, and the hemicelluloses very little, if at all. With the resumption of photosynthetic activity, starch reappeared and the hemicelluloses were again synthesized.

Stagheaded pasture trees, P. W. ROBBINS (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 264-266, figs. 3).—The death of top limbs on isolated pasture trees is ascribed to root injury caused by the concentration of animals seeking shade. Roots are injured and the soil is compacted to a harmful degree. Trees protected from animals and pruned of their deadwood may be restored to a thrifty condition.

Fire control Notes, [July 1941] (U. S. Dept. Agr., Forest Serv., *Fire Control Notes*, 5 (1941), No. 3, pp. 11-123-160, figs. 9).—In the usual manner (E. S. R., 85, p. 204), general articles relating to fire suppression, hazards, control equipment, etc., are presented.

The application of sampling to log scaling, B. LEXEN. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 7, pp. 624-631, figs. 2).—Based on a study of the application of sampling technic to scaling ponderosa and lodgepole pine logs, it is suggested that a simple sample of 2 percent provides a fair estimate of the total, but more refined and intensified sampling is needed to estimate true volume within allowable limits. A sample of 1,000 logs was found adequate to yield a reliable estimate of the total volume of any number of logs, but the technic would

not be practical where less than 5,000 logs were involved. Sampling was found equally effective when applied to either lodgepole or ponderosa pine. No appreciable difference was found between the errors of mechanical and random samples, and since mechanical sampling is more easily applied in practice it is recommended for sample log scaling.

DISEASES OF PLANTS

The advance of the fungi, E. C. LARSE (New York: Henry Holt & Co., 1940, pp. 488, pls. 6, figs. 58).—This popular historical account of advances in science and their applications deals mainly with fungi and plant diseases, but also refers to such material as the phylloxera of the grape and the work of Pasteur and Koch with respect to bacteria. Bibliographies of the 31 chapters at the end of the book refer to "some 500 of the principal scientific papers, books, and other published writings of the past and present upon which this history is based," and include the starting dates of some of the periodicals which have played a leading part in the story.

Adventures in the plant-disease world, H. S. FAWCETT (Berkeley: Univ. Calif. Press, 1941, pp. [1]+34, figs. 12).—Following a semipopular treatment of the background and history of plant pathology, this lecture gives more detailed accounts of the three main types of parasitic disease organisms as exemplified by the citrus brown rot and foot rot fungus (*Phytophthora citrophthora*), the bacterial citrus blast and black pit (*Phytomonas syringae*) and citrus canker, and the virus-induced citrus psorosis. There are 53 references.

Phytopathology: Thirty year index (Volumes 1–30, 1911–1940), edited by F. V. RAND (Lancaster, Pa.: Science Press Ptg. Co., 1941, pp. V+335).—This dictionary-type subject-author index, published by the American Phytopathological Society, is discussed editorially on page 577.

The Plant Disease Reporter, [June 1 and 15, 1941] (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 10, pp. 279–298, fig. 1; 11, pp. 299–320, figs. 2).—In addition to the host-parasite check-list revision, by F. Weiss (No. 10, *New to Juglans*, and No. 11, *Juniperus to Larix*), the following items are noted:

No. 10.—Wisconsin plant quarantine law, by R. El. Vaughan; outstanding diseases of economic crops in New Jersey in 1940, by E. S. Clark; breaking of red raspberry shoots associated with out-of-season cold, by H. W. Anderson; reports on downy mildew of onion in Louisiana and New York; and brief notes on spread of strawberry red stele in Virginia, cereal rusts in Texas, wheat nematode in Georgia, and smut on rescue grass in Arkansas.

No. 11.—A second strain of bean rust in Hawaii, by G. K. Parris and M. Mat-suura; late blight (*Septoria api*) of celery in Virginia, by H. T. Cook; diseases of small grains in South Carolina, by G. M. Armstrong; cereal diseases in California, by C. A. Suneson; further distribution of the mimosa wilt (*Fusarium perniciosum*), by E. R. Toole; and brief notes on the occurrence of azalea flower spot in California, wheat stem rust in Oklahoma, Dutch elm disease in Maryland, and tobacco downy mildew in Virginia.

[Studies in plant pathology by the Arizona Station] (Arizona Sta. Rpt. 1940, pp. 90–102, figs. 7).—Reports of progress are included on angular leaf spot of cotton, *Phymatotrichum* root rot in pecan orchards (coop. U. S. D. A.), black stem rust of wheat, bacterial bud rot of canna (*Phytomonas cannae*), stippen of apples, *Phytophthora* bud rot of Washington palms, *Verticillium* wilt of cotton, southern sclerotial rot of cotton, seed treatment for damping-off of peas and corn, tomato yellows, lettuce rot due to *Erwinia carotovora*, a new storage rot of grape-

fruit associated with *Alternaria citri*, bacterial necrosis of the giant cactus (*Carnegiea gigantea*), and dry root rot of citrus. Diseases unusually prevalent or new to Arizona are reported, the latter being covered kernel smut and bacterial blight of sorghum on perennial Sudan grass, rust on yellow-flowered alfalfa, and root knot on *Menodora* spp.

[Phytopathological studies by the Florida Station] (*Florida Sta. Rpt.* 1940, pp. 72-73, 99-100, 104-112, 113-118, 119-120, 145, 146-148, 169-170, 184-185, 188, 191, 195-196, 197, 201, 205, 206-210, figs. 5).—Brief reports of progress, by J. R. Watson, H. E. Bralley, W. B. Shippy, D. G. A. Kelbert, J. R. Beckenbach, A. N. Brooks, A. H. Eddins, M. N. Walker, G. F. Weber, A. S. Rhoads, W. B. Tisdale, G. D. Ruehle, K. W. Loucks, E. West, L. O. Gratz, R. K. Voorhees, G. R. Townsend, F. S. Andrews, and R. R. Kincaid, are given on investigations of root knot control in vegetables and tobacco by resistant varieties and by mulching; early blight of celery and causes of seedbed failures; control of various tomato and lettuce diseases; calcium cyanamide for the nematode "crimp" disease of strawberries; control of bacterial ring rot and brown rot, and of scab, spindle tuber, and leaf roll of potatoes; *Fusarium nivium* wilt and other fungus diseases of watermelons and their control; control of *F. lycopersici* wilt of tomatoes; *Clitocybe* mushroom rot of citrus and other woody plants in Florida; a bark disease of Tahiti lime trees probably due to a virus; fruit rots of grapes, including varietal reactions to black rot and bitter rot; host relations and factors influencing the growth and parasitism of *Sclerotium rolfsii*; causes of failure of seed and seedlings of various ornamental and crop plants in different Florida soils and development of preventive methods; comparative study of the pathogenicity and taxonomy of species of *Alternaria*, *Macrosporium*, and *Stemphylium*; control of *Rhizoctonia* diseases of potatoes and vegetable crops; *Sclerotinia sclerotiorum* pink rot, *Cercospora apii* early blight, and other diseases of celery; *Phomopsis* blight and fruit rot of eggplant; citrus gummosis and psorosis; spray tests for cucumber downy mildew; pepper seedbed troubles, including damping-off and unfavorable humus content and their control; *Oamellia* dieback of unknown cause; fungus witches'-broom of oleander; citrus scab and its control; melanose and stem-end rots of citrus fruits; diseases of papayas and gladiolus; seed- and soil-borne diseases of vegetable crops, including bacterial bean blight, potato seed-piece decay, and use of infrared irradiation for drying tubers to prevent decay in transit; bean breeding for resistance to powdery mildew and rust; control of damping-off and early blight of celery; field and plant-bed diseases of tobacco, and varietal resistance to black shank, root knot, mosaic, and downy mildew, and fungicidal control of the last-named disease; cultural practices for controlling tobacco root knot; spraying for control of *Cephalosporium mycoidea* on guava and rust on Chinese jujube trees; control of potato diseases in Dade County, including bacterial soft rot, early and late blight, and *Xylaria* rot of tubers; diseases of avocado and their control, including Zn deficiency, dieback, scab, blotch, and black spot; and control of foliage diseases of tomatoes by spraying, and a new or little-known disease due to *Phytophthora* sp.

[Plant disease studies by the Maine Station] (*Maine Sta. Bul.* 400 (1940), pp. 191-193, 214-215, 252-253, 256-263, 264-268).—Reports of progress, by D. Folsom, E. B. Tobey, B. E. Plummer, Jr., R. Bonde, E. S. Schultz, R. A. Hyre, G. W. Simpson, and D. H. Perrin, are included on fungicidal control of apple scab; and potato diseases, including production of disease-free stocks, strength of mercuric chloride solutions for seed potato treatment, spray tests for early blight, control of ring rot by disinfection of cut seed and by resistant varieties, seed disinfection for *Rhizoctonia*, purple top disease, effect of different per-

centages of virus diseases on tuber yields, Florida test plat for disease incidence in seed stock, and insecticides in relation to the control of leaf roll and mosaic.

The behavior of certain viruses in plant roots, R. W. FULTON. (Wis. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 7, pp. 575-598, figs. 5).—The roots of the 23 species tested were invaded by all viruses, becoming systemic after leaf inoculation, those used including common tobacco mosaic, tobacco ring spot, cucumber mosaic, potato ring spot, and common bean mosaic. Tobacco and tomato roots were also infected by direct inoculation with several viruses. In such cases the viruses usually moved rapidly downward and slowly upward, but this movement was reversed when the plants were darkened and sugar solution was supplied via the roots. The downward rate of movement of a virus in the roots approximated its downward rate in the leaves and stem. Virus movement in the roots was always unidirectional, but simultaneous movement in both directions occurred in the stem. Tobacco mosaic virus was less concentrated in the roots of tobacco and tomato than in the leaves. Extracts of healthy tobacco and tomato roots partially inactivated this virus. In root extracts the thermal inactivation point of viruses was 4°-8° C. lower than in leaf extracts. There are 37 references.

Normal-tobacco-plant protein and tobacco-mosaic-virus protein as anaphylactogens and precipitinogens in the guinea pig, H. P. BEALE and B. C. SIEGAL (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 441-454, fig. 1).—Optimum conditions by which guinea pigs could be severely or fatally shocked with tobacco-mosaic-virus protein were a single sensitizing dose of 37 mg. of virus protein followed by a test dose of 18 mg. of the same protein in about 40 days. No such uniform results were obtained with normal-tobacco-plant protein. Because the latter failed to shock consistently when used in small amounts, the *in vivo* methods of anaphylaxis seem unsuited for detecting traces of normal-tobacco protein which may contaminate chemically purified virus-protein preparations. Desensitization of guinea pigs sensitized to normal-tobacco protein occurred after a nonfatal shock. After sensitization to tobacco-virus protein this often failed to take place. In sera of animals injected with this antigen, precipitin to normal-tobacco-plant protein was not demonstrable but precipitin to tobacco-mosaic-virus protein was regularly demonstrable. The failure to desensitize with virus protein is believed to be due to the high precipitin content of the guinea pig serum. Amounts of virus adequate to induce severe or even fatal shock have thus far proved insufficient to remove all the circulating antibody. Under such conditions, surviving animals were frequently susceptible to severe or fatal shock the following day. This difficulty of desensitization associated with persistence of circulating antibody suggests a correlation between anaphylaxis and the precipitin antibody. The neutralizing antibody to tobacco-mosaic antigen in guinea pig serum decreases with the precipitin titer.

Transmission of plant viruses by dodder, F. JOHNSON (*Phytopathology*, 31 (1941), No. 7, pp. 649-656, fig. 1).—The experiments reported indicate that *Cuscuta campestris* may act as a virus vector by its natural parasitic development among plants. Successful transmission was obtained with the viruses causing aster yellows, bushy stunt, cucurbit mosaic, curly top, and tobacco mosaic, and with one virus of the complex previously referred to as white-clover mosaic. Tobacco ring spot virus was not transmitted from diseased to healthy tobacco by this method. Neither tobacco mosaic virus, which was transmitted, nor tobacco ring spot virus, which was not, is able to multiply in this species of dodder. The time required for symptoms to appear in the

test plants after successful parasitization by infected dodder was greater than that following mechanical or insect transmission.

Plants reported resistant or tolerant to root knot nematode infestation, J. TYLER (*U. S. Dept. Agr., Misc. Pub. 406 (1941), pp. 91*).—This compilation first discusses the problems involved in studying resistance, presents definitions, and gives the basis of selection of material. The arrangement of the main text is by generalized reports on plant groups and by plant species and varieties reported to be resistant or tolerant. A summary of plants usually recommended to growers as resistant and of those recommended only with reservations is provided, and there are 269 literature references.

Parasitism of the root-knot nematode in leaves and stems, M. B. LINFORD. (Hawaii. Pineapple Prod. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 7, pp. 634-648, figs. 9).—When *Heterodera marioni* larvae were placed in buds of cowpea and some other plants, infection of leaves and stems occurred and galls developed, together with distortion, crinkling, mild mottling, vein clearing, and occasional enations. The females matured and laid eggs, and successive generations developed in the presence of a persistent cambium. Males were relatively abundant in cowpea leaves. Larvae entered through fresh wounds into organs too mature to be penetrated otherwise. In aerial parts the larvae migrated to young vascular bundles and exhibited strong polarity, nearly all heads being directed up the axis or toward the margin of a leaf. Among the factors normally limiting this nematode to the roots, sensitivity to desiccation and irradiation appeared most important.

Calcium-boron ratio as an important factor in controlling the boron starvation of plants, M. DRAKE, D. H. SIELING, and G. D. SCARSETH. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 5, pp. 454-462, fig. 1).—Determinations made in electrodiluted colloid from a Miami soil and electrodiluted humus extract from a Brookston loam adjusted to 16 pH levels and to which H_2BO_3 had been added gave complete B recovery in all cases regardless of pH or Ca concentration. It is thus concluded that B is not absorbed by the clay or humus complexes or made insoluble by Ca. Tests with a Crosby silt loam showed that neither the Ca supply nor added N, P, or mannitol affected the amount of B recovered. Pot tests with corn and tobacco indicated that neither the active Ca nor the pH affected the uptake of B by these plants. Growth of Turkish tobacco on a Norfolk sand in greenhouse pots appeared normal when the Ca:B ratio in the plants did not exceed 1,340:1, but a ratio of 1,500:1 therein was correlated with severe B starvation symptoms. The data here reported, together with the results obtained by others, are believed to indicate that B starvation results when the Ca:B ratio in the plants becomes unfavorable, and undoubtedly this ratio for different kinds of plants will be found to vary. There is the possibility that these ratios may be used as a guide in determining the need of B fertilization.

Mineral nutrition of the genus *Brassica* with particular reference to boron, F. B. CHANDLER (*Maine Sta. Bul. 404 (1941), pp. [4]+307-400, figs. 64*).—The results of numerous experiments with *Brassica* spp. conducted in sand and water cultures may be summarized as follows: These plants normally contain insufficient B in their seeds to develop the cotyledons and first leaves. The greatest total plant weight was obtained when 0.3 or 0.5 p. p. m. of B was supplied continually, the latter amount producing larger heads on cauliflower and better quality in rutabaga. The fresh weight increased with duration of B supply, but this increase was not a straight-line function of the duration of B application or the amount supplied. In severe cases of deficiency there was a translocation of B from the older leaves into the stem and younger leaves.

Deficiency symptoms varied with the kind and age of plant when B was a limiting factor. The symptoms are curling, rolling, and rugosity of the leaves, chlorosis of the leaf margin, swelling, splitting, and a corky appearance of the stems and petioles, brittleness of petioles, development of brown areas in the stems, and a reduction in size and quality of the edible part. Plants grown with an inadequate followed by a sufficient supply of B developed more normally than those adequately supplied at first but later changed to a no-B solution. B deficiency dwarfs the plant, keeping all organs except the edible part in the same mass relationship. Plants supplied with the optimum amount produced the greatest weight per unit of leaf area. Root development was retarded at pH 4, 7.5, and 8.5, but this was not due to B fixation. Plants may receive all of their B through the leaves. No other single element tried affected B deficiency. The undifferentiated cells of B-deficient tissue elongated in any direction, thereby crushing other internal cells or causing swellings on the surface of petioles and stems. The cork cambium of wounded tissue failed to produce normal cells in B-deficient plants, and in severe deficiency the cork cambium was not formed at all. B deficiency of the root tip became evident in a few days, whereas the apical meristem was the last tissue to show it. All symptoms of B deficiency here reported are secondary expressions of the alteration and retardation of meristematic activity. There are 87 references.

Comparative fungicidal properties of copper derivatives, J. E. LEYS, E. F. DEGERING, and C. L. POETER. (Purdue Univ.). (*Amer. Chem. Soc. Mtg.*, 101 (1941), *Abstr. Papers*, pp. 20A-21A).—An abstract.

"Bends," a new disease of grasses and cereals, G. W. FISCHER. (Wash. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 7, pp. 674-676, fig. 1).—The author describes this new disease, which manifests itself by a more or less sharp but not angular bend in the culm at or just above the uppermost node such that the portion above the bend hangs down approximately parallel with the region below it. The inflorescence is usually fairly normal. Thirty-seven species of grasses, including wheat and representing 16 genera, have been found affected. The cause is unknown, although various fungi have been isolated.

Rootrots of cereals, P. M. SIMMONDS (*Bot. Rev.*, 7 (1941), No. 6, pp. 308-332). A review of recent research trends and contributions, with 104 references.

Further studies on cereal rusts in India, K. C. MEHTA (*Imp. Council Agr. Res. [India], Sci. Monog.* 14 (1940), pp. [3]+VII+224, pls. 16, figs. 3).—The three sections of this monographic study¹ consider the physiological races of *Puccinia graminis tritici*, *P. graminis avenae*, *P. triticea*, and *P. glumarum*; the role of alternate hosts (barberries and *Thalictrum*); and overwintering of the parasites in relation to annual occurrence of infections.

The relative susceptibility of different lots of oat varieties to smut, I. W. TERVET. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 7, pp. 672-673).—Eleven seed lots of Anthony oats grown at 4 Minnesota locations and in different years were inoculated with a purified collection of *Ustilago levis* and planted (1940) at St. Paul. The number of infected heads produced ranged from 14 to 72 percent. Greenhouse tests showed a close correlation between rapidity of germination and relative resistance to attack, the most susceptible seed lot requiring 48 hr. more to produce primary leaves than the most resistant seed lot. Similar results were obtained when a purified collection of *U. avenae* was used. Seed lots of the Rusota, Iogold, and Gopher varieties also showed differences in smut susceptibility.

¹ Indian Sci. Cong. Proc. [Calcutta], 16 (1929), pp. 199-223.

Factors affecting infection in rye smut and subsequent development of the fungus in the host, L. LING (*Phytopathology*, 31 (1941), No. 7, pp. 617-633, figs. 4).—The greatest amount of smut was produced on rye when inoculated seeds were germinated in a soil at pH 7.36, and a relatively dry soil not only favored infection but also subsequent development of the fungus in the host. Various fertilizer treatments carried out in a poor, sandy soil did not affect the amount of smut produced, but with sand cultures in the greenhouse results suggested that solutions high in potassium phosphate and low in $\text{Ca}(\text{NO}_3)_2$ and MgSO_4 decrease the amount of smut, whereas reversal in these ratios tends to increase the amount of smut. Variations in intensity and duration of light had but little effect on the smut production in Prolific rye, whereas in Dakold lengthening of the light period increased it somewhat. Rapidity of germination of rye seed affected the amount of infection by *Urocystis occulta*, for at low temperature (15°C .) but not at higher temperatures seeds that germinated rapidly were more apt to be infected. In Dakold and possibly other varieties, smut-infected plants tend to be more easily killed during winter than smut-free plants. Picric acid at the rate of 240 mg. per kilogram of soil reduced the amount of smut from 37 to 20 percent, but smaller amounts of picric acid were less effective and the heavier applications injured the plants. There are 22 references.

Studies on the control of internal breakdown of table beets by the use of boron, G. J. RALEIGH, O. A. LORENZ, and C. B. SAYRE ([*New York*] *Cornell Sta. Bul.* 752 (1941), pp. 16, figs. 3).—Four important factors making B deficiency of beets serious on Ontario and similar New York soils are the high B requirement of beets, alkaline soil reactions, use of little or no manure, and deficiencies in soil moisture. Interaction among these and other factors in internal breakdown are at present little understood, but the evidence indicates that when high yields accompany unfavorable conditions it is likely to be more severe than if yields are low. Under some conditions as little as 5 lb. of borax to the acre may greatly reduce the trouble. Quantities as large as 50 lb. will not eliminate it if conditions favoring severe breakdown are present, but results to date indicate this amount will give satisfactory commercial control, especially if the crop is harvested as soon as symptoms appear. Observations indicate that foliage symptoms are not reliable indicators during some seasons. Borax (50 lb. to the acre) thoroughly mixed with the fertilizer and applied before the beets are planted is recommended as a standard application for high-lime soils that have not been heavily fertilized with borax in the past. To avoid poor physical condition and possible loss of ammonia, the fertilizer should be applied soon after mixing. More difficulties with poor physical condition are likely to be encountered when using double strength than with single-strength fertilizers. These recommendations are for beets grown on alkaline soils; 50 lb. to the acre may be injurious on soils more acid than those used in these experiments and are almost certain to be injurious for B-sensitive crops, such as beans, grown on any soil. Until more evidence is available it may be advisable to grow B-tolerant crops such as cabbage rather than B-sensitive crops such as beans on fields fertilized with 50 lb. of borax to the acre for beets the previous year.

Stem blight of cotton caused by *Alternaria macrospora*, L. LING and J. Y. YANG (*Phytopathology*, 31 (1941), No. 7, pp. 664-671, figs. 4).—This stem blight is reported as widespread in Szechwan Province, China, during warm and humid weather, and the causal fungus was easily isolated. Uninjured cotyledons, leaves, stems, and bolls proved susceptible to artificial inoculation, but wounding often increased the infection to 100 percent. *Gossypium arboreum* was susceptible

at all growth stages, but *G. hirsutum* became somewhat resistant with age. According to spore measurements, all isolates from stem or boll were similar and belonged to the *A. macrospora* group previously reported only as a leaf-spotting fungus. The optimum temperature for infection and for growth in culture was 28° C., and the fungus grew well over a wide pH range. It may overwinter on dead cotton stalks in fields, but there is some indication that the disease is also carried on the seed.

Relation of fertilizer balance to potash hunger and the *Fusarium* wilt of cotton. V. H. YOUNG and W. H. THARP. (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 410 (1941), pp. 24, figs. 3).—Three cotton varieties were planted (1937–39) on fine alluvial soil, where in previous years *Fusarium* wilt and potash (K) deficiency had been severe, under nine different fertilizer treatments based on 600 lb. of 6–8–6 fertilizer per acre and varied to provide a series of complete and incomplete combinations. Despite a wide divergence in comparative wilt susceptibility, the relative effects of the treatments were proportionately similar on all three varieties. Fertilizer combinations containing K in the lowest amount used (6–12–4) effectively controlled K hunger (“rust”) and gave marked reductions in wilt incidence, but the highest applications (6–12–12 and 0–4–12) proved more effective against wilt. Unbalanced combinations with respect to K requirements resulted in higher incidence of wilt and pronounced symptoms of K hunger, and phosphate (P) alone was followed by definite increases in wilt over unfertilized controls. All fertilizers used (except P alone) gave highly significant yield increases on the Half and Half variety, and the highest K application proved more efficient than one-third that amount. Under the conditions, K gave definite control of K hunger and very marked control of wilt, whereas high applications of N and P or P without K were ineffective or even detrimental from the standpoint of controlling these troubles. Increased susceptibility to wilt was associated with increased severity of K-deficiency symptoms in the cotton plant. It is concluded that in the alluvial soils of eastern Arkansas, where these studies were made, fertilizer balance is highly important in any program for controlling these two diseases. High N, and particularly P, may actually increase the severity of K hunger and wilt when applied to soils relatively low in available K.

Preliminary note on an endophytic fungus of *Lolium temulentum* [trans. title], J. B. MARCHIONATTO (*Rev. Chil. Hist. Nat.*, 42 (1938), pp. 30–32, fig. 1).

The effect of varying the lime content and copper lime ratios of bordeaux mixture in potato spraying in central Jersey. R. H. DAINES and J. C. CAMPBELL (*N. J. State Potato Assoc., Hints to Potato Growers*, 22 (1941), No. 2, pp. [4]).—From the evidence of tests with formulas ranging from 4–4–100 to 20–20–100, it seems safe to conclude that for optimum yields from Irish Cobbler in central New Jersey when foliage diseases are not a problem a 10–10–100 bordeaux mixture should be used throughout the season. Previous work has also demonstrated that this mixture will give satisfactory control of early and late blight. Although increasing the lime content or the concentration of the mixture may at times have certain advantages, it seems clear that these advantages are not reflected in increased yields.

Rhizoctonia root rot of sweet clover. W. J. CHEREWICK (*Phytopathology*, 31 (1941), No. 7, pp. 673–674).—A dark brown, dry root rot of sweetclover caused by *Rhizoctonia* (probably *R. solani*) was found in several districts of Manitoba, Canada, and Minnesota. *Rhizoctonia* apparently has not been previously reported as pathogenic to this host. The strain attacking sweetclover also attacked other leguminous forage and garden crops but was not pathogenic to cereals.

Suggested program for the control of Granville wilt and black shank of tobacco. H. R. GARRISS and D. E. ELLIS (*N. C. Agr. Col. Ext. Cir.* 247

(1941), pp. 10, figs. 3).—Field crops, vegetable crops, ornamentals, and weeds are listed as susceptible, resistant, and immune to the bacterial wilt (*Phytophthora* (= *Pseudomonas*) *solanacearum*), and suggested rotations are given for North Carolina farms where both black shank (*Phytophthora nicotianae*) and Granville wilt are encountered, as well as rotations where only one or the other is present. The most important sanitary practices are listed and procedures suggested for the use of individual farmers, action agencies, or planning groups for establishing control practices.

Diseases of fruits and nuts, R. E. SMITH. (Calif. Expt. Sta.). (*Calif. Agr. Col. Ext. Cir.* 120 (1941), pp. 168, figs. 80).—This handbook, which supersedes part of California Experiment Station Circular 265 (E. S. R., 50, p. 838), presents information on diseases arranged by crop plants, and also sections on diseases affecting many crops and on fungicides and other chemicals for controlling plant diseases. An index is provided.

Report of damage to fruit plants by the November 1940 cold, V. W. KELLEY and R. L. McMUNN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 54-65).

The use of eradicant sprays for controlling apple scab in Illinois, 1940 results, D. POWELL, H. W. ANDERSON, and R. KOHN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 213-234, figs. 5).—In the tests reported Elgetol decreased the initial scab inoculum by 86-90 percent, resulting in a lessening of primary infection and thus facilitating the prevention of secondary infection. The most satisfactory ground coverage occurred with the 600-gal.-per-acre rate of spray, and 0.5 percent is considered the best dilution to use. The penetrating agent in Elgetol increased the efficiency of the sodium cresylate in destroying the perithecia. Treating dead leaves is looked upon as a supplement rather than a substitute control measure. A reduction in number of foliage sprays is not now recommended where ground spraying is practiced. If a ground treatment-modified foliage schedule is used, a lead arsenate-codling moth schedule should follow to prevent summer scab fruit infection. Such a schedule might be carried out on varieties susceptible to spray injury but less so to scab. Nicotine (Black Leaf 155) was not effective for secondary infection. A lead arsenate-weak Bordeaux schedule was slightly more effective than a lead arsenate-hydrated lime schedule in preventing secondary infection. The chief advantage in Elgetol lies in the assurance of better scab control and the unlikelihood of difficulties when seasonal conditions favor scab or when foliage sprays cannot be applied according to schedule.

Sulfur fungicides in the 1939-40 apple scab control experiments, H. W. ANDERSON and D. POWELL. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 322-326).—The tests reported confirmed past experience in that sulfurs depositing particles of extreme fineness in a uniform coating proved effective in scab control when properly applied, whereas those of larger particle size were undependable.

Virus diseases of the peach, H. H. THORNBERRY. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 191-205, figs. 5).—Yellow-red virosis (30 references) and rosette (37 references) are reported to have been especially important in 1940, and recent knowledge pertaining to their causal agents, hosts, symptoms, spread, distribution, and control is presented.

Rapid transmission of yellow-red virosis in peach, E. M. HILDEBRAND. (Cornell Univ.). (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 485-496, figs. 4).—Yellow-red virosis ("X" disease) was transmitted by budding from peach to peach with production of symptoms within a month. Cutting off the tops of inoculated plants apparently liberated the virus from the diseased buds

and speeded its invasion. Such rapid transmission will greatly facilitate studies of this virus, and a similar technic may possibly be applicable to the study of other viruses.

Red stele root rot of the strawberry, H. W. ANDERSON. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 383-393).—The author discusses the history and studies of this disease in Illinois and elsewhere, describes the symptoms and the causal organism (*Phytophthora fragariae*) and its life history, and outlines various possible methods of control suggested by his studies. It was early realized that permanent successful control must be based on securing resistant varieties. Early trials (1933-34) revealed the Aberdeen as probably immune, and thus far no case of infection on this variety has been found by several investigators. Its resistance is also transmitted to a high proportion of its progeny. A number of selections and crosses with Aberdeen are proving satisfactory or promising.

Strawberry root rot in relation to microbiological changes induced in root rot soil by the incorporation of certain cover crops, A. A. HILDEBRAND and P. M. WEST (*Canad. Jour. Res.*, 19 (1941), No. 6, Sect. C, pp. 183-198, pl. 1, fig. 1).—Premier variety strawberries were planted in spontaneously infected soil in which several agricultural crops had been grown and turned under and in other lots of the same soil steam-sterilized or fertilized with barnyard manure. Plants grown in the steam-sterilized soil remain free from infection, as did those of the soybean series until the third season when they became slightly infected. Plants in the manure, corn, red clover, timothy, and untreated series all became diseased, the severity increasing in the order named. Although different fungi were found on roots of the various cover crops, a specific fungus dominated in each, as did the nematode *Pratylenchus pratensis* in the timothy and clover series. This build-up of specific organisms appeared to be correlated with the incidence and severity of the disease of strawberry roots that followed in the respective series. However, fungus infection of strawberry plants grown in the variously treated soils was negligible and, on the whole, not related to that of the preceding cover crop. Fewer bacteria were found adjacent to the roots of healthy than of diseased plants, and there was a striking relationship between the incidence of certain groups of bacterial isolates and severity of the disease. The equilibrium between presumably "harmful" bacteria and the innocuous, normally occurring rhizosphere types is designated the "bacterial balance index." There are marked differences in the microbiological equilibria of the different soil series, and increased severity of root rot was associated with a fall in the bacterial balance index.

The microbiological balance of strawberry root rot soil as related to the rhizosphere and decomposition effects of certain cover crops, P. M. WEST and A. A. HILDEBRAND (*Canad. Jour. Res.*, 19 (1941), No. 6, Sect. C, pp. 199-210, pl. 1, fig. 1).—"Soybean and red clover, grown as cover crops and incorporated into strawberry root rot soil, showed a marked difference in ability to control the disease on variety Premier. Soybean caused a striking reduction in the incidence of root rot and a drastic shift in the bacterial equilibrium of the soil. Red clover had little effect on the severity of the disease or the general microflora of the soil. A study of 'rhizosphere effects' reveals that the characteristic differences between the resultant bacterial equilibrium of the soils in which the two leguminous plants were grown could not be attributed to influences exerted by the latter in the living state. However, the bacterial types favored during decomposition in experimental cultures of tissues of red clover and of soybean, each inoculated with root rot soil, were identical with those isolated from root rot soil with which red clover and soybean, respectively, had been incorporated. In contrast to the putrefactive

decomposition of red clover, soybeans apparently underwent a carbohydrate break-down that could be reproduced essentially in culture by the substitution of glucose for soybean tissues. Beneficial changes in the bacteriology of actual root rot soils could be induced by the decomposition of pure carbohydrate in place of soybean. The favorable alteration in the bacterial equilibrium was accompanied by a corresponding modification of the fungus flora such that potentially pathogenic forms were replaced by presumably innocuous ones. These carbohydrate-treated soils were capable of producing strawberry plants with well-developed healthy root systems. The ability of soybean to control strawberry root rot therefore seems to depend primarily on a carbohydrate type of break-down in diseased soil, causing a highly favorable shift in the microbiological equilibrium. The decomposition of red clover, on the other hand, did not under the same conditions induce these salutary effects."

Two pine plantings near cultivated red currants in New York, W. H. SNELL (*Jour. Forestry*, 39 (1941), No. 6, pp. 537-541, figs. 3).—Since 1916 the author has been convinced that cultivated red currants are of no importance in disseminating the blister rust to white pines and that they constitute no danger to the growth of this species. Data here presented on two pine plantings confirm this conclusion in that very little pine infection, and most likely none at all, was traceable to red currants, but that probably all of it originated from sporidia from wild gooseberries.

Control of chlorosis in American grapes, F. B. WANN (*Utah Sta. Bul.* 299 (1941), pp. 27, figs. 8).—Physiological chlorosis is reported as probably the most serious difficulty in developing the Concord grape industry in Utah. It can be cured by a variety of treatments, but in all cases recovery is only temporary. Injection of iron ammonium oxalate, iron ammonium citrate, iron phosphate, or iron citrate into the woody stems resulted in over 80 percent recovery, but in most cases the vines were again chlorotic the next year. Spraying the vines with iron sulfate (10 lb. to 100 gal.) also brought recovery when applied several times during the growing season, but again the control did not hold over. None of the soil treatments thus far tried has given satisfactory control, and efforts to obtain resistant Concord "strains" by selection of promising cuttings have been unsuccessful. All the common *labrusca* varieties and hybrids tested were susceptible, with the possible exception of Keuka. The possibility of obtaining a chlorosis-resistant *labrusca* variety to replace Concord seems remote, but Concord scions grafted on *vinifera* roots produced vigorous vines and remained practically free from chlorosis. This procedure thus offers a practical and possibly permanent solution of the chlorosis problem in the Concord grape. Rose of Peru, Tokay, Muscat, and Malaga rootstocks all produced healthy vines when grafted with Concord scions.

Control of grape diseases and insects, R. H. HURT (*Virginia Sta. Bul.* 332 (1941), pp. 12, figs. 3).—"The purpose of this bulletin is to provide the grape growers of the State with the latest information on spray materials and their application for the control of grape diseases and insects." The emphasis among diseases is on black rot, and field spray tests of 1939 and 1940 on various bordeaux spray combinations are included.

Observations on the diseases of citrus in Paraguay [trans. title], H. S. FAWCETT and A. A. BITANCOURT (*Biologico*, 6 (1940), No. 10, pp. 289-296).

Avocado diseases in Florida, H. E. STEVENS and R. B. PIERCE (*U. S. Dept. Agr. Cir.* 582 (1941), pp. 47, figs. 16).—This handbook provides information on the causes, spread, and control of diseases of the fruit and bark and on nine diseases of minor importance. There are 13 references.

Powdery mildew of the mango, B. N. UPPAL, M. K. PATEL, and M. N. KAMAT (*Jour. Univ. Bombay, n. ser.*, 9 (1941), No. 5, pp. 12-16, fig. 1).—The author re-

views the taxonomic history of the causal fungus (*Erysiphe cichoracearum*), gives its morphological and physiological characteristics, and presents a technical description of the conidial phase.

Gladiolus diseases and insects, L. McCULLOCH and C. A. WEIGEL (*U. S. Dept. Agr., Farmers' Bul. 1860 (1941), pp. 11+18, figs. 9*).—This is a compendium of information on over a dozen gladiolus diseases and several insect pests and their control.

Botrytis core-rot of gladiolus, B. O. DODGE and T. LASKARIS (*Jour. N. Y. Bot. Gard., 42 (1941), No. 496, Sect. 1, pp. 92-95, figs. 5*).—A brief historical review and description of this cork disease, which is primarily a storage rot, with control recommendations.

Papulaspora gladioli, B. O. DODGE and T. LASKARIS (*Bul. Torrey Bot. Club, 68 (1941), No. 5, pp. 289-294, figs. 2*).—The fungus causing the so-called smut disease of gladiolus and hitherto believed to be *Urocystis gladioli* is shown to be a species of the form genus *Papulaspora*. An emended description is given, and *P. gladioli* n. comb. is proposed for it. Powdery masses of the dark brown bulbils enclosed beneath the scales or in cavities in shrunken diseased tissue simulate the sori of *Urocystis* chlamydospores.

New observations on bleeding canker of hardwoods, P. P. PIRONE (*New Jersey Stat. Nursery Disease Notes, 13 (1941), Nos. 10, pp. 37-40; 11, pp. 41-44*).—After summarizing the history and present status of this disease due to *Phytophthora cactorum*, the author discusses the more recent observations that (1) not every tree with bark cankers exhibiting a pink ooze is necessarily infected by this fungus, (2) not every tree infected by *P. cactorum* succumbs within a short time, (3) not all trees with this disease exhibit the pink ooze in the vicinity of bark lesions, and (4) there is as yet no clear-cut evidence that diseased trees actually recover following any specialized infection treatment. Reference is also made to the present confusing recommendations regarding control.

Cankers and decay of yellow birch associated with Fomes igniarius var. laevigatus, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A. et al.). (*Jour. Forestry, 39 (1941), No. 6, pp. 559-560, fig. 1*).—"In the Adirondacks and elsewhere trunk cankers associated with sterile fungus material and rot are relatively common. These cankers and the associated rot are shown to be caused by *F. igniarius laevigatus*."

Transmission of the Dutch elm disease pathogen by Scolytus multistriatus and the development of infection, K. G. PARKER, P. A. READ, L. J. TYLER, and D. L. COLLINS. (Cornell Univ.). (*Phytopathology, 31 (1941), No. 7, pp. 657-663*).—*Ceratostomella ulmi* occurred both on the surface and in the intestinal tract of *S. multistriatus*, though the intestinal tracts were positive in a lower percentage of beetles and produced fewer fungus colonies per culture. Healthy potted elm trees were inoculated by confining fungus-infested beetles on branches or liberating them in screen cages containing the trees. The parasite readily became established in scars made by infested beetles, and infection occurred within a few weeks or not at all. The fungus was readily reisolated from the feeding scars as long as 3 yr. after they had been made.

Fusarium wilt of the mimosa tree (Albizia julibrissin), E. R. TOOLE. (U. S. D. A.). (*Phytopathology, 31 (1941), No. 7, pp. 599-616, figs. 3*).—This vascular wilt due to *F. perniciosum* was found in Virginia, North Carolina, South Carolina, and Georgia. Culture studies separated the various isolates into three groups based on character of growth, viz, appressed, raised mycelial, and raised sclerotial. It was found from soil inoculations that differences in virulence are related to variations in cultural characters, the raised mycelial class being highly virulent, the raised sclerotial cultural class moderately so, and the ap-

pressed cultural class nonvirulent. In comparison with *A. fulvibrissin*, the susceptibility of *A. lebbek*, *A. lophantha*, *A. thorelii*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, *Oercis canadensis*, and *Mimosa pudica* was tested, only *A. lebbek* and *A. lophantha* proving susceptible. There are 18 references.

The effect of certain heart rot fungi on the specific gravity and strength of Sitka spruce and Douglas-fir, T. C. SCHEFFER, T. R. C. WILSON, R. F. LUXFORD, and C. HARTLEY (*U. S. Dept. Agr., Tech. Bul. 779 (1941), pp. 24, figs. 13.*)—This study was undertaken to improve the bases for selecting and grading lumber for airplane use. Although marked differences in strength between wood slightly infected by *Polyporus schweinitzii* and badly decayed wood were found, classification into strength groups by appearance would be subject to large errors. The initial formation of white pockets marks a fairly definite stage in strength reduction by *Fomes pini*, which may be used as a guide. A 20-percent reduction in toughness may be expected in Sitka spruce infected by *P. schweinitzii* to the point where it can first be detected by microscopic or culture methods. Similar strength reduction by *F. pini* was not encountered prior to the formation of pockets. Commercial "firm red heart" (*F. pini*) showed losses in maximum crushing strength parallel to grain and modulus of rupture in static bending not much greater than 10–15 percent and, when dry, no more than a 10–25 percent loss in impact bending up to the time pockets were formed. Losses in specific gravity were of little value as indexes of incipient decay by either fungus. Wood most severely attacked by *P. schweinitzii* gave reductions of about 10 percent specific gravity, 30 percent in maximum crushing strength, and 95 percent in toughness, as compared with reductions by *F. pini* in the late pocket stage of about 30, 70, and 95 percent, respectively. Sound wood close to infected zones had normal strength, indicating that such wood can be safely used provided the limits of decay are established.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Wildlife Circulars 2 and 3 (*U. S. Dept. Int., Bur. Biol. Survey, Wildlife Cirs. 2 (1939), pp. 16; 3 (1940), pp. 11.*)—Further contributions in this series (*El. S. R.*, 82, p. 352) are: Nos. 2, Officials and Organizations Concerned With Wildlife Protection, 1939, by F. G. Grimes; and 3, Federal Aid in Wildlife Restoration—General Information, by A. M. Day, which supersedes *U. S. D. A. Miscellaneous Publication 350 (El. S. R.*, 81, p. 390).

[Fish and Wildlife Circulars 4–13] (*U. S. Dept. Int., Fish and Wildlife Serv., Wildlife Cirs. 4 (1940), pp. IV+13, fig. 1; 5, pp. 8; 6 (1941), pp. IV+18, figs. 15; 7 (1940), pp. IV+10, figs. 2; 8 (1941), pp. [4]+15, figs. 2; 9 (1940), pp. 13; 10, pp. 17; 11 (1941), pp. IV+32, pls. 7, figs. 10; 12, pp. II+30; 13, pp. 7.*)—These contributions on wildlife research continue the series and include the following: Nos. 4, Pseudopregnancy in Domestic Rabbits, by G. S. Templeton; 5, Information for the Guidance of Fieldmen and Cooperators of the Fish and Wildlife Service Engaged in the Control of Predatory Animals and Injurious Rodents; 6, The House Rat, by J. Silver; 7, An Improved Method for Revealing the Surface Structure of Fur Fibers, by J. I. Hardy and T. M. Plitt; 8, Silver Fox Pup Values in Relation to Date of Birth, Age of Vixens, and Other Factors, by C. E. Kellogg; 9, Regulations Relating to Migratory Birds and Certain Game Mammals, 1940; 10, Officials and Organizations Concerned With Wildlife Protection, 1940, compiled by F. G. Grimes; 11, Wildlife of the Atlantic Coast Salt Marshes, by W. L. McAtee; 12, Text of Federal Laws Relating to the Protection of Wildlife; and 13, Acquisition of National Wildlife Refuge Lands Under the Migratory Bird Conservation Act, by R. Dieffenbach.

The ecology and population dynamics of the wild rabbit (*Oryctolagus cuniculus*), H. N. SOUTHERN (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 509–526,

pl. 1, figs. 2).—This paper gives the results of a year's field work on populations of the wild rabbit.

Rate of metabolism in *Microtus* and *Peromyscus*, D. M. HATFIELD. (Minn. Expt. Sta.). (*Murrelet*, 20 (1939), No. 3, pp. 54-56; abs. in *Minnesota Sta. Rpt.* 1940, p. 42).

Rat lures, J. A. LUBITZ, C. R. FELLERS, and A. S. LEVINE. (Mass. Expt. Sta.). (*Soap and Sanit. Chem.*, 17 (1941), No. 2, pp. 99, 103).—In further tests (E. S. R., 75, pp. 509, 510), monosodium glutamate, oil of rhodium imitation, extract of cheese imitation, oils of anise, caraway, cinnamon, and peppermint, brewer's yeast powder, two byproducts of the manufacture of thiamin from rice hulls, and thiamin chloride were found to possess no merit as attractants to albino rats.

The Audubon guide to attracting birds, edited by J. H. BAKER (*Garden City, N. Y.: Doubleday, Doran & Co., 1941, pp. XVIII+268, pls. 9, figs. 11*).—This guide treats of the subject in 12 chapters and an appendix and includes a 16-page classified list of references.

Variations in the heart rate of birds: A study in physiological ecology, E. P. ODUM. (Univ. Ill. et. al.). (*Ecol. Monog.*, 11 (1941), No. 3, pp. 299-326, figs. 22).—Studies of 22 North American, 4 European, and 4 domestic species of birds are reported, and a list is given of 42 references to the literature cited.

Deltokeras multilobatus, a new species of cestode (Parauteriniinae: Dilepididae) from the twelve-wired bird of paradise (*Scolecoides melanoleucus* [melanoleucus] (Daudin): Passeriformes), O. W. OLSEN. (Minn. Expt. Sta.). (*Zoologica*, 24 (1939), No. 3, pp. 341-344, pl. 1; abs. in *Minnesota Sta. Rpt.* 1940, p. 41).

Tetrameres americana, Oram 1927, found in eastern cardinal in Missouri, A. J. DURANT and D. R. KNIGHT. (Mo. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 7, pp. 373-374, figs. 2).—Report is made of the finding of *T. americana* in the eastern cardinal (*Richmondia cardinalis cardinalis*), this being the first time in thousands of autopsies on various kinds of birds that it has been detected by the author. The parasite is said to be of fairly common occurrence in chickens in North America and in some localities is of considerable pathological significance. It has also been reported as a parasite of the bobwhite quail (*Colinus virginianus*).

Further new species of *Ornithodoros* from bats (Acarina: Argasidae), R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 17, pp. 910-914, pl. 1, figs. 2).—*O. concanensis*, taken from a bat cave in Texas and a bat-inhabited mine tunnel in Arizona, and *O. kelleyi*, collected from bats (*Pipistrellus* sp.) in Utah and Colorado, are described as new.

[Contributions on economic insects and insect control] (*Iowa State Hort. Soc. [Rpts.]*, 73 (1938), pp. 139-147, 251-260, 401-409, figs. 7; 74 (1939), pp. 42-49, 139-140, 299-312, figs. 6).—Contributions relating to economic insects presented at the seventy-third annual meeting of the society include Orchard Insect Pests of 1938, by C. H. Richardson and H. Gunderson (pp. 139-147) and Results of Iowa's 1937 and 1938 Honeybee Disease Resistance Program, by O. W. Park, F. C. Pellett, and F. B. Paddock (pp. 401-409) (both Iowa Expt. Sta.); and Some Important Shade Tree Insect Pests in Iowa, by H. D. Tate (pp. 251-260) (Iowa State Col.). Those presented at the seventy-fourth meeting include Apple Insects of 1939, by C. H. Richardson and L. T. Graham (pp. 42-45) (Iowa Sta.); An Effective Control for the Larger Apple Curculio, by R. L. Parker (pp. 45-47) (Kans. Sta.); Two Fumigants for Insects in Greenhouses, by C. H. Richardson (pp. 139-140); Notes From the Honey Plant Test Garden, by F. C. Pellett (pp. 299-305); and Pollen Needs for Broodrearing (pp. 305-307), Overcoat Winter Protection Cases (pp. 307-310), and Honey Production Under Drought Conditions (pp. 311-312), all by R. L. Parker (all Kans. Sta.).

[Contributions on economic zoology and entomology] (*Iowa Acad. Sci. Proc.*, 46 (1939), pp. 397-458, figs. 6).—Among the contributions presented are the following: Influence on Oocyst Production of Concentration and Kind of Yeast in Rations of Rats Infected with *Eimeria nieschulzi*, by P. C. Waters (pp. 397-402) (Iowa State Col.); New Iowa Records of Acrididae (Orthoptera), by R. L. King (pp. 417-418); A Preliminary List of the Mycetophilidae (Diptera) Known to Occur in Iowa, by H. E. Jaques and B. G. Berger (pp. 419-421); Some Observations on the Habits of the Thirteen-Lined Ground Squirrels (*Citellus tridecemlineatus tridecemlineatus*) (Mitchill) of Iowa, by G. M. Bush (pp. 429-437); Some Phase of Wound Healing in an Insect (*Melanoplus differentialis*), by G. Johnson (pp. 443-444); The Influence of Colchicine on the Germ Cells of Insects (*Melanoplus differentialis* and *Gryllus assimilis*), With Special Reference to the Cytoplasmic Inclusions, by T. P. Dooley (p. 445); Factors Controlling the Incubation Period of Birds, by W. N. Keck (p. 453); A study of *Trichomonas columbae*, by M. Stiles (p. 454); Effects of X-Rays on the Early Development of the Grasshopper, by T. C. Evans (p. 456); The Time of Embryonic Determination of Sensoria and Antennal Color, and Their Relation to the Determination of Wings, Ocelli, and Wing Muscle in Aphids, by K. A. Stiles (pp. 456-457); and The Biological Action of Rotenone on Lake Fauna, by H. L. Hamilton (pp. 457-458).

[Contributions on economic insects and insect control] (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 161-175, 234-247, 252-299, figs. 19).—Contributions presented include the following: Some Recent Contributions by English Workers to the Development of Methods of Insect Control, by C. T. Gimmingham (pp. 161-175); The Strawberry Aphid *Pentatrichopus (Capitophorus) fragariae* Theob., With Notes on *P. potentillae* Walk. and *P. tetrarhodus* Walk., by I. Thomas and F. H. Jacob (pp. 234-247); Laboratory Tests with Liquid insecticides on the Eggs of the Bed-bug (*Cimex lectularius* L.), by S. Callaway and A. J. Musgrave (pp. 252-261); The Insecticidal Properties of Certain Species of *Annona* and of an Indian Strain of *Mundulea sericea* ("Supli"), by F. Tattersfield and C. Potter (pp. 262-273); The Problem of the Evaluation of Rotenone-Containing Plants—V, The Relative Toxicities of Different Species of *Derris*, by J. T. Martin (pp. 274-294) (E. S. R., 80, p. 369); and The Maintenance of High Atmospheric Humidities for Entomological Work with Glycerol-Water Mixtures, by C. G. Johnson (pp. 295-299). In the laboratory tests with liquid insecticides, β -butoxy- β -thiocyanodiethylether appeared to be superior to the other compounds tested for the destruction of the eggs of the bedbug. A bibliography accompanies each of the several contributions.

[Insect investigations by the Arizona Station] (*Arizona Sta. Rpt. 1940*, pp. 62-63).—A progress report (E. S. R., 84, p. 73) which mentions scale insects, cotton insects, a midge reared from pumpkins and squash, the black-margined or pecan aphid *Monellia costalis*, and the new alfalfa weevil *Hypera brunneipennis*.

[Entomological studies by the Florida Station] (*Florida Sta. Rpt. 1940*, pp. 72, 73-76, 158-163, 171-172, 176-177, 187-188, 205, figs. 2).—Progress (E. S. R., 83, p. 650) at the main station discussed included work with the Florida flower thrips *Frankliniella cephalica bispinosa* Morg., onion thrips, and pepper weevil, all by J. R. Watson; beneficial insects and a bait for mole crickets, by Watson and W. L. Thompson; control of the leaf-footed bug and biological habits of the eastern lubber grasshopper, both by H. E. Bratley and Watson; the nut case-bearer on pecans, by Watson, S. O. Hill, and Bratley; gladiolus thrips, by Watson and J. W. Wilson; and biology and control of aphids, by A. N. Tissot. Work at the Citrus Substation included effect of fertilizers on purple scale development,

combined control of scales and mites on citrus, timing of oil emulsion sprays for citrus, *F. cephalica bispinosa* on oranges, and *Chaetothrips orchidi* Moul., on citrus (E. S. R., 84, p. 79), all by Thompson. Everglades Substation projects reported were wireworm, bean leafhopper, and corn budworm studies and notes on the prevalence and control of the sugarcane borer, all by Wilson; and the gladiolus thrips, by Watson and Wilson. The Subtropical Substation project reported dealt with mites on potato seed pieces, by C. D. Ruehle.

[Entomological investigations by the Maine Station] (*Maine Sta. Bul.* 400 (1940), pp. 188-191, 203-206, 207-208, 209-213, 268-272, 276-277, figs. 4).—A progress report (E. S. R., 83, p. 363) noting insects affecting apples (the gypsy moth and apple maggot), by F. H. Lathrop; insecticide studies, including spreaders for sprays and residues, by J. T. Pedlow; truck crop insect investigations (Mexican bean beetle and its control, insecticides for the striped cucumber beetle and the squash bug, pea aphid studies, and cutworms and armyworms of garden and truck crops), all by J. H. Hawkins; potato aphid sprays and insect vectors of potato viruses, both by G. W. Simpson; and blueberry insects (the blueberry maggot and blueberry thrips *Frankliniella vaccinii* Morg.), by Lathrop.

[Entomological studies of the Utah Station], G. F. KNOWLTON (*Farm and Home Sci. [Utah Sta.]*, 2 (1941), No. 2, p. 3, figs. 3).—A practical account of control methods for the pea weevil and asparagus beetle.

The numbers of insects caught in a light trap at Rothamsted during four years, 1933-1937, C. B. WILLIAMS (*Roy. Ent. Soc. London, Proc., Ser. A*, 15 (1940), No. 7-9, pp. 78-80).

Chemistry in insect control, E. G. THOMSEN and M. H. DONER (*Soap and Sanit. Chem.*, 17 (1941), No. 1, pp. 107, 109, 111, 125).

Droplet size of insecticides, E. M. SEARLS. (Univ. Wis.). (*Soap and Sanit. Chem.*, 17 (1941), No. 2, pp. 94-96, fig. 1).

Methods of testing insecticides against bedbugs and cockroaches, F. L. CAMPBELL. (Ohio State Univ.). (*Pests*, 9 (1941), No. 4, pp. 12-13, 31).

The chemical evaluation of pyrethrum flowers (*Chrysanthemum cinerariacifolium*): The extraction of the flowers for analysis and the preparation of colourless concentrates of the pyrethrins, J. T. MARTIN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 178-185, fig. 1).—In biological trials to determine the efficacy of petroleum ether as solvent for the extraction of pyrethrum flowers for analysis, 95 percent of the toxic material was extracted from flowers 1 yr. old after only 3 hours' percolation. An extraction period of 8 hr. with petroleum ether is suggested. A method of preparing colorless extracts of pyrethrum and analytical data for such extracts are given. They are shown to be of value for the preparation of concentrates of the pyrethrins. The preparation of a colorless concentrate containing 93 percent of total pyrethrins, as determined by a modified Sell method, is described.

Insecticide stickers: Use of rosin-mineral emulsion as a sticker for agricultural insecticides, R. D. CHISHOLM. (U. S. D. A.). (*Soap and Sanit. Chem.*, 17 (1941), No. 1, pp. 113, 125).

A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit, P. A. NEAL, W. C. DREESSEN, T. I. EDWARDS, W. H. REINHART, S. H. WEBSTER, H. T. CASTBERG, and L. T. FAIRHALL (*U. S. Pub. Health Serv., Pub. Health Bul.* 267 (1941), pp. XI+181, figs. 42).—Report is made of an investigation extending over 3 yr. of the possible injury to the health of people exposed to lead arsenate, whether by ingestion on fruit, by inhalation of spray mist or dust, or by other forms of exposure. The toxicological studies of the effect of lead arsenate on man and animals are being published separately. A

discussion of the possible relation of other diseases and abnormalities to lead arsenate exposure and a bibliography of 93 titles are included.

Further studies on the dwarf disease of rice plant, T. FUKUSHI (*Jour. Faculty Agr., Hokkaido Imp. Univ.*, 45 (1940), No. 3, pp. [2]+83-154, pls. 2, figs. 10).—Report is made of further^{*} studies (E. S. R., 70, p. 654; 81, p. 75; 82, p. 204) of the relation of the leafhopper *Nephotettia apicalis cincticeps* Uhl. to the virus of dwarf disease of rice to determine how and to what extent the virus would be passed on to the offspring of leafhopper. The findings are considered to confirm those previously noted, indicating that the virus multiplies in the insect carrier.

Factorial studies on potato dusting materials, J. B. SKAPTASON and F. M. BRONGERT. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 1, pp. 1-9).—In further work, which tends to confirm the earlier findings (E. S. R., 80, p. 371), the "3-way" dust, consisting of rotenone, pyrethrum, and sulfur, and several other mixtures, have given increases in yield from 70 to 90 bu. per acre even in a dry season. Sulfur again failed to show significant effects on yield, and the main effect seems to be due to rotenone, pyrethrum, and cuprous oxide. The increases in yield appear to be related to some extent with the insect control by these various materials. Pyrethrum caused a significant decrease in leafhoppers, and there was an interaction between pyrethrum and cuprous oxide in leafhopper control. Cuprous oxide in the absence of pyrethrum also caused a decrease in leafhoppers, but where these materials were used together the control was no better than with either material alone. The yield paralleled the leafhopper control in these cases. Rotenone reduced the numbers of flea beetles and aphids, which might have been sufficient to account for the increased yields obtained with this material.

[Contributions on fruit insects] (*Ohio State Hort. Soc. Proc.*, 74 (1941), pp. 26-66, 128-136, figs. 2).—Contributions presented at the annual meeting held in January 1941 include The European Red Mite, by J. S. Houser and C. R. Cutright (pp. 26-34), Recent Developments in the Codling Moth Problem, by C. R. Cutright and M. A. Vogel (pp. 34-43), and Five Troublesome Strawberry Pests, by R. B. Nelswander (pp. 128-136) (all Ohio Expt. Sta.); and Leafhoppers Can Weaken Apple Trees and Reduce the Crop, by G. E. Marshall, N. F. Childers, and H. W. Brody (pp. 61-66) (Ind. Sta. and Ohio State Univ.).

The relation of subterranean insects to the raspberry crown gall, A. A. GRANOVSKY. (Minn. Expt. Sta.). (*Hoosier Hort.*, 22 (1940), No. 5, pp. 67-69; abs. in *Minnesota Sta. Rpt.* 1940, pp. 43-44).

Injurious and beneficial insects affecting the cranberry, H. J. FRANKLIN. (Mass. Expt. Sta.). (*Cranberries*, 5 (1941), No. 9, pp. 4, 6-7).—A brief report of the work of the year with cranberry insects, including the hill fireworm *Tiascala finitella* Walk., cranberry weevil, cranberry aphid *Myzus scammelli* Mason, cranberry root grub *Amphicoma vulpina*, gypsy moth, grape anomala *Anomala errans*, black-headed fireworm (*Rhopobota* sp.), blunt-nosed leafhopper (*Ophiola* sp.), cranberry white grub (*Phyllophaga* sp.), cranberry fruitworm, and colaspis rootworm *Colaspis brunnea costipennis*.

Insect infestation of cacao beans in the producing countries, with a note on the extent to which *Ephestia elutella* Hub. and *E. cautella* Wlk. establish themselves in warehouses and factories in Great Britain, J. M. NICOL (*Bul. Imp. Inst. [London]*, 39 (1941), No. 1, pp. 17-25).

Tentative spray schedule for the control of insects on Michigan roses, E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 275-280).

^{*} *Jour. Faculty Agr., Hokkaido Imp. Univ.*, 37 (1934), No. 2, pp. [2]+41-164, pls. 6, figs. 2.

Minnesota forest insect survey for 1939, A. C. HODSON ([*St. Paul*]: *State Dept. Conserv., Div. Forestry*, 1940, pp. 11; rev. in *Minnesota Sta. Rpt.* 1940, p. 54).—This report includes a general summary of the forest insect situation in 1939 and a discussion of the damage, distribution, and abundance of the important pests.

Important insect pests of deciduous shade trees, H. E. BURKE. (U. S. D. A.). (6. *West. Shade Tree Conf., Oakland*, 1939, *Proc. Ann. Mtg.*, pp. 37-43).

Toxicity of red squill powder and extract for chickens, rabbits, and guinea pigs, J. A. LUBITZ and C. R. FELLERS (Mass. Expt. Sta.). (*Jour. Amer. Pharm. Assoc., Sci. Ed.*, 30 (1941), No. 5, pp. 128-130).—The experimental tests conducted indicate that chickens and rabbits are not affected by levels of red squill extract and red squill powder which are definitely toxic to rats. Rabbits, however, may be susceptible to very high levels of red squill dosage. Guinea pigs are less resistant to poisoning by red squill extract and powder than are rats. It is believed that red squill poisoning is dependent on species susceptibility rather than on ability or inability to vomit.

Further notes on Symphyla, with descriptions of three new species from California, A. E. MICHELbacher. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 32 (1939), No. 4, pp. 747-757, pls. 2).—Reporting further (E. S. R., 81, p. 815), *Symphylella oviceps* from Merced County, *S. sierrae* from Briceburg, and *Hanseniella vandykei* from Woodacre are described as new.

Studies on Schistocerca gregaria Forsk., VIII-X (*Indian Jour. Agr. Sci.*, 6 (1936), No. 5, pp. 1005-1030, pls. 3; 7 (1937), No. 2, pp. 317-325, pls. 2; 10 (1940), No. 6, pp. 927-944).—Three further contributions (E. S. R., 76, p. 658) are presented: Influence of Carbon Dioxide on Development of Black Pigmentation in *Schistocerca gregaria* Forsk., by M. A. Husain and C. B. Mathur (pp. 1005-1030); Some observations on the Histology of the Blood of the Desert Locust, by C. B. Mathur and B. N. Soni (pp. 317-325); and Role of Water in the Bionomics of the Desert Locust, by M. A. Husain, T. Ahmad, and C. B. Mathur (pp. 927-944).

Termites and their control, N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Pests*, 9 (1941), No. 3, pp. 22-27).

The gladiolus thrips in Florida, J. W. WILSON (*Florida Sta. Bul.* 357 (1941), pp. 24, figs. 6).—This gladiolus pest was first discovered in Florida in 1932. The larvae and adults damage the plants by feeding on the florets, leaves, and corms. Warm, dry periods such as occur in Florida from February to May are most favorable for their development. Eggs from unmated females produced only males, but the author concluded that this method of reproduction occurs but rarely under natural conditions. This thrips did not survive cold storage at 38° to 40° F. for periods of from 3 to 4 mo. Ethylene dichloride-carbon tetrachloride mixture, calcium cyanide, and mercuric chloride are suggested for treating corms, while tartar emetic is recommended as a field spray.

Notes on other thrips found on gladiolus, by J. R. Watson, are included.

A new species of Tibraca injurious to rice in Ecuador (Hemiptera-Heteroptera: Pentatomidae), H. G. BARBER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 43 (1941), No. 5, pp. 110-111, fig. 1).—A pentatomid bug causing injury to rice in Ecuador is described as new under the name *T. similima*.

Studies on the cotton jassid Empoasca devastans Distant in the Punjab.—I, Varietal susceptibility and development of the pest on different varieties of cotton, PRADE MOHAN VERMA and M. AFZAL (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 911-926).—Presented with a statistical appendix by M. Afzal and Dwarka Nath Nanda.

New American Tingitidae (Hemiptera), C. J. DRAKE. (Iowa State Col.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 4, pp. 141-145).—Descriptions are given of seven new American lace bugs, including one from Guam. Two of the species

were intercepted at ports of entry into the United States, namely, *Phatnoma ecuadoris* from Ecuador at New York City and *P. barberi* from Colombia at San Francisco.

Resistance of strains of red clover to pea-aphid injury. H. H. JEWETT (*Kentucky Sta. Bul.* 412 (1941), pp. 41-55, figs. 2).—Field and insectary tests were conducted from 1936 to 1940 to discover whether a strain or strains of red clover might be found definitely resistant to the pea aphid. Differences in the number of aphids on several strains in 1936 and 1937 failed to show that aphids preferred any one strain. The number of aphids collected from individual plants varied considerably, indicating that there might be preference for plants within strains. Since the strains compared for relative resistance to aphid injury were in most instances fairly well adapted to the regions or States for which they were named and because of the wide distribution of the pea aphid, it is probable that most of the clovers tested were somewhat resistant to aphid injury. This would account in part for the relatively small difference in resistance shown by the clovers tested. The author concludes that it is likely that highly resistant plants may be found among the clovers used.

Western aphid notes (Homoptera: Aphididae), G. F. KNOWLTON. (Utah Expt. Sta.). (*Ent. News*, 52 (1941), No. 5, pp. 136-138).—This annotated list adds to the known distribution of a number of aphids and includes a description of a new species found at Fisher's Pass, Tooele County, Utah, under the name *Aphis tetradyimia*.

Bionomics and control of the fig-tree borer *Batocera rufomaculata* De Geer (Coleoptera: Lamelidae), M. A. HUSAIN and M. ABDUL WAHID KHAN (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 945-959, pl. 1).

Found—An insect enemy of soybeans, W. P. FLINN. (Ill. Expt. Sta. and Ill. Nat. Hist. Survey). (*Soybean Digest*, 1 (1941), No. 7, p. 4, fig. 1).—A brief account is given of the grape colaspis, the grubs of which during the past 3 yr. have damaged thousands of acres of soybeans in Illinois, cutting the yield from 10 to 50 percent or more. The adults emerge from the soil cells during July and the first part of August and feed on the leaves of many different plants, including grape, all the legumes, the petals of flowers, leaves of smartweed, silks of corn, and a great many other plants. The eggs are laid in late July and early August and hatch in about 2 weeks into tiny grubs that feed for a time and as the weather gets cool migrate downward in the soil to a depth of from 6 to 8 in., where they pass the winter. Nearly all of the beans injured were on land that had been in soybeans the preceding year, and the injuries seemed to increase quite rapidly where they were run on the same ground for 3 yr. in succession. The best methods of combating the pest are fall plowing or early spring plowing of legume sod followed by as many diskings as seem practical, considering the cost and the returns to be expected from the crop. If the land is to be planted to corn, planting should be delayed as long as the variety to be grown will permit. So far as known, there was no case where injury to soybeans occurred where beans did not follow soybeans or red clover.

Studies of the biology of the death-watch beetle *Xestobium rufo-villosum* De G.—III, Fungal decay in timber in relation to the occurrence and rate of development of the insect, R. C. FISHER (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 545-557).—This, the third in a series on the biology of *X. rufo-villosum* (El. S. R., 80, p. 79), describes investigations on the effect of decay upon the suitability of timber for infestation by this insect.

The role of food and its constituents on the productivity and longevity of the cotton-stem weevil *Pemphres affinis* Fst., P. N. KRISHNA AYYAR and V. MARGABANDHU (*Indian Jour. Agr. Sci.*, 10 (1940), No. 6, pp. 901-910, fig. 1).

Life history and control of the sugar-beet webworm (*Loxostege sticticalis* (L.)), J. H. PEPPER and E. HASTINGS (*Montana Sta. Bul. 389 (1941), pp. 32, figs. 11*).—The beet webworm is found in the Great Plains and Rocky Mountain regions of North America, as well as in eastern, north-central, and north-eastern Europe and western Asia. In the United States it injures sugar beets and other field and truck crops, as well as many other plants. Because of intermittent sterility large flights of adults are not necessarily indicative of heavy larval populations. Microscopic studies and the general appearance of moths are useful in detecting the percentage of sterility. During the first three larval instars feeding is confined largely to the under surface of leaves, but the later stages may feed anywhere on the plants. The two types of larval migration noted were a definitely oriented migration and a diffusion in search of food. The factors determining the percentage of larvae entering the prepupal stage are not known, though it is believed that their influence is exerted during or before the first instar. Usually there is one generation of this insect a year in Montana, although a second occasionally occurs and rarely a partial third. Contact insecticides are effective against the first three instars, while paris green is an efficient poison for all the larval instars except when heavy infestations occur. Water barriers may also be used to prevent migrations. There are 77 literature citations.

The value of bait traps in codling moth control, M. L. BOBB, A. M. WOODSIDE, and E. H. GLASS. (Va. Expt. Sta.). (*Va. Fruit, 29 (1941), No. 4, pp. 21-23*).—In a study in Virginia, 100 apple trees containing bait traps were compared with adjoining areas without traps. The increase in clean fruit in the baited blocks, including both dropped and picked fruits, was as follows: Nelson County, 18.6 percent in 1939 and 8.4 percent in 1940; Augusta County, 7.7 percent in 1939 and 18.4 percent in 1940; and Botetourt County, 17.5 percent in 1940.

The pale western cutworm (*Agrotis orthogonia* Morrison) in Utah, C. J. SORENSON and H. F. THORNLEY (*Utah Sta. Bul. 297 (1941), pp. [1]+23, figs. 8*).—This insect has caused damage to dry-farm grains in Utah periodically for the past 25 yr. Larvae feed beneath the soil surface except for a short period immediately after hatching and during times of heavy rainfall. The main stems of the grain plants are attacked. Overwintering eggs hatch about March 1. Larvae at maturity (usually June 1-15) are $1\frac{1}{4}$ to $1\frac{1}{2}$ in. long. When feeding is completed the larva burrows into the soil (3 to 5 in. deep), where it forms an earthen cell and remains until the adult stage is attained (about September 1). Only one generation occurs annually. The moths are dark gray to yellowish gray with a wing expanse of 1 to $1\frac{1}{2}$ in. Oviposition begins about September 1 and is usually completed by October 15. Most effective control results by preventing oviposition in summer-fallowed land. Such areas should be plowed early in the spring and kept clean by cultivation until August 1, at which time a crust should be allowed to form on the surface, since moths cannot lay eggs in surface-crust soil. Poison baits are not practical, and, though parasitic and predaceous enemies destroy many individuals, their combined efforts fail to prevent outbreaks. Cold wet weather during the oviposition period seriously interferes with oviposition, while wet springs cause high larval mortality.

The noctuid moth *Mocis repanda*, enemy of rice in Costa Rica [trans. title], A. BIERING (*Cent. Nac. Agr. [Costa Rica] Bol. Téc. 26 (1940), pp. 21, figs. 8*).—An account of the noctuid pest of rice, *M. repanda*, its natural enemies, observations by L. A. Salas, and means of control.

Proceedings and papers of the eleventh annual conference of the California Mosquito Control Association, edited by R. B. VAN ETEN and H. F. GRAY (*Calif. Mosquito Control Assoc., Ann. Conf., Proc. and Papers, 11 (1940), pp. [2]+71, pls. 4*).—Contributions presented at the annual conference (E. S. R., 82, p. 801) held at Berkeley, Calif., December 16, 1940, included Infectious Equine Encephalomyelitis, by C. U. Duckworth (pp. 6-8); The Relationship of the Distribution of Cases of Equine Encephalomyelitis (Human and Equine) and Mosquitoes in California, by H. C. Aitken (pp. 8-15) (Univ. Calif.); Equine Encephalomyelitis in Kern County, by W. C. Buss (pp. 15-23); The Mosquito as a Possible Vector of Equine Encephalomyelitis, by M. H. Merrill (pp. 23-31); Present Day Problems in Starting a Mosquito Abatement District, by E. C. Robinson (pp. 37-39); Research With *Aedes varipalpus* (Coq.), the Pacific Coast Tree-Hole Mosquito, by W. C. Reeves (pp. 39-43) (Univ. Calif.); and Mosquito Control Under a Health Department, by H. E. Blake (pp. 43-45).

Indigenous malaria and its vectors in Minnesota, W. A. RILEY. (Minn. Expt. Sta.). (*Jour. Lancet, n. ser., 59 (1939), No. 7, pp. 311-312; abs. in Minnesota Sta. Rpt. 1940, p. 37*).

Carlos Finlay and yellow fever, C. E. FINLAY, edited by M. C. KAHN (*New York: Oxford Univ. Press [1940], pp. XII+249, [pl. 1], figs. 26*).—The theory advanced, the singling out, and the experimental transmission of yellow fever by the yellow fever mosquito by C. Finlay and the confirmation of this theory by the U. S. Army Yellow Fever Commission are dealt with at length in this work. A bibliography of contributions on yellow fever (pp. 231-236) and other medical and scientific publications (pp. 237-240), by Finlay, is included in appendixes.

Gall midges (Cecidomyiidae) affecting grass-seed production in mid-Wales and West Shropshire, together with descriptions of two new species, D. P. JONES (*Ann. Appl. Biol., 27 (1940), No. 4, pp. 533-544*).—An account is given of 20 species of Cecidomyiidae which affect seed production in 10 species of grasses in mid-Wales and West Shropshire. Eleven of the species are believed to be new to science, and descriptions are given of 2, namely, *Contarinia festucae* on *Festuca* spp. and *Sitodiplosis cambriensis* on *Poa* spp. Keys are provided to facilitate the identification of the larvae on the various host grasses.

The biology and control of the sorghum midge, E. V. WALTER (*U. S. Dept. Agr., Tech. Bul. 778 (1941), pp. 27, figs. 8*).—This pest, first noted in Alabama in 1895 and in Texas in 1898, is apparently of foreign origin, since it is not known to breed extensively on any native American plant. Larvae extract juice from developing seed. In the Southern States, where the insect is most injurious, a generation may be completed in 13 to 16 days and as many as 13 generations may develop annually. When the average temperature is about 75° F. most of the larvae form naked pupae and emerge within a few days, but as the temperature goes either above or below this a varying proportion form cocoons and remain as cocooned larvae until conditions are favorable for emergence. Only cocooned larvae are able to overwinter in the United States. Spring emergence is stimulated by rain and occurs from 10 to 22 days after a rainfall, depending on the temperature during the intervening period. Adults usually live but a day. The use of pure seed and practices which produce a uniformly blooming crop are suggested control measures.

Choloropidae (Diptera) of the Oriental region: Notes and synonymy, C. W. SABROSKY. (Mich. Expt. Sta.). (*Ann. and Mag. Nat. Hist., 11. ser., C (1940), No. 35, pp. 418-427*).

The Amazon fly, a parasite of the sugarcane borer, K. A. BARTLETT. (P. R. Expt. Sta.). (In *The Puerto Rico Sugar Manual*. New Orleans: A. B. Gilmore, [1941], pp. 12-14, figs. 5).

Sheep blow-fly investigations.—VIII, Observations on larvicides and repellents for protecting sheep from attack, R. P. HOBSON (*Ann. Appl. Biol.*, 27 (1940), No. 4, pp. 527-532).—Reporting further upon this subject (E. S. R., 80, p. 662), an account is given of experiments on the protection by chemical means of sheep against maggot infestation. The repellent properties of a number of substances were tested under field conditions. Vegetable oils gave the most promising results, but no repellent was found which protected sheep for more than 2 weeks. Various larvicides were tried as sheep dips, with a view to finding a substitute for arsenic, but none proved superior to a proprietary arsenic-sulfur powder dip. Encouraging results were obtained with insoluble arsenites, and further work is in progress with these compounds.

The yellow chapote, a native host of the Mexican fruitfly, C. C. PLUMMER, M. MCPHAIL, and J. W. MONK (*U. S. Dept. Agr., Tech. Bul.* 775 (1941), pp. 12, figs. 4).—Yellow chapote fruit (*Sargentia greggii* S. Wats.) was found infested by Mexican fruitfly larvae as early as 1931. This tree occurs naturally in northeastern Mexico and has been found growing in Brownsville, Tex. The average infestation in terms of larvae per fruit ranged from none to 0.88. Parasites were common in infested fruit during the summer but scarce in off-season fruit in the winter. Trapping Mexican fruitflies at Santa Engracia, Tamaulipas, Mexico, for most of 3 yr. and part of a fourth year indicated that the number of flies coming into grapefruit trees in the fall seemed to depend on the production and infestation of chapote fruit during the previous summer.

A new record for *Lipoptena cervi* L. in New York State, E. J. GERBERG and F. C. GOBLE (*Bul. Brooklyn Ent. Soc.*, 36 (1941), No. 1, p. 26).—The mallophagan parasite *Tricholipeurus virginianus* Peters and a hippoboscid, *L. cervi*, are recorded as taken at post mortem from the neck region of a fawn (*Odocoileus virginianus borealis*) in Hamilton County.

Siphonaptera: A study of the species infesting wild hares and rabbits of North America north of Mexico, G. M. KOELS (*U. S. Pub. Health Serv., Natl. Inst. Health Bul.* 175 (1940), pp. III+34, pls. 3, figs. 8).—Wild rabbits and hares in North America are said to be normal hosts for nine species and subspecies of fleas representing three genera. A key for their separation, notes on these forms, parasite and host list, and a bibliography are included.

Food and development of the worker and the queen honeybee, M. H. HAYDAK. (Minn. Expt. Sta.). (*Gleanings Bee Cult.*, 67 (1939), No. 12, pp. 740-742, 776-777; 68 (1940), No. 1, pp. 24-26; abs. in *Minnesota Sta. Rpt.* 1940, pp. 38-39).

Correction of type locality for two species of Mutillidae described by Frederick Smith (Hymenoptera), C. E. MICKEL. (Minn. Expt. Sta.). (*Roy. Ent. Soc. London, Proc., Ser. B*, 8 (1939), No. 9, pp. 192-194; abs. in *Minnesota Sta. Rpt.* 1940, p. 40).

A monograph of the neotropical mutillid genus *Hoplomutilla* Ashmead (Hymenoptera: Mutillidae), C. E. MICKEL (*Rev. Ent.*, 10 (1939), Nos. 2, pp. 337-403; 3, pp. 641-717; abs. in *Minnesota Sta. Rpt.* 1940, pp. 39-40).—A monographic treatment of the genus *Hoplomutilla*, in which 87 species, 2 subspecies, and 2 varieties are recognized. Keys for the separation of the species of males and females, a geographical catalog of the species, and a bibliography are included.

Experimental studies in insect parasitism.—VII, The effects of different hosts on the parasite *Trichogramma evanescens* Westw. (Hym.: Chalcidi-

doidea), G. SALT (*Roy. Ent. Soc. London, Proc., Ser. A, 15 (1940), No. 10-12, pp. 81-95, figs. 3*).—This further study (E. S. R., 80, p. 368) deals with the chalcidoid parasite *T. evanescens*, which has been reared from the eggs of more than 100 species of hosts, representing Lepidoptera, Diptera, Coleoptera, Hymenoptera, Hemiptera, and Neuroptera, which include vegetarian, saprophagous, predaceous, and blood-sucking forms. The size of individuals of this parasite is largely controlled by the size of the hosts in which they develop. The vigor, fecundity, longevity, and the rate of development of individuals of *Trichogramma* are affected by their hosts. Through its effect on their size, the host influences the behavior of females of *Trichogramma* selecting hosts for their progeny. The host is one of the environmental factors that must be controlled in any quantitative work on *Trichogramma*.

A new species of *Mirax* parasitic on *Coptodisca arbutiella* Bsk. (Hymenoptera: Braconidae), G. S. WALLEY (*Canad. Ent.*, 73 (1941), No. 5, pp. 83-84).—Under the name *M. coptodisciae*, description is given of a new braconid reared from the lepidopterous leaf miner *C. arbutiella* in the leaves of the madrona (*Arbutus menziesii*) at Vancouver, B. C.

Apparatus and technique for the study of the egg parasites of the beet leafhopper, C. F. HENDERSON (*U. S. Dept. Agr. Cir. 593 (1941), pp. 19, figs. 8*).—Fluctuations in egg parasite populations of the beet leafhopper were studied by rearing and determining field material in the laboratory. Specially designed rearing cabinets which maintained constant light and temperature conditions proved useful for approximating parasite populations in a given unit of host plant material. Seasonal fluctuations, winter mortality, synchronization with the host, spring emergence, and other phenomena of the parasites were detected by the use of these cabinets. Temperatures of 80° and 85° F. and light intensities of from 4.8 to 47.6 foot-candles were tested in the cabinets for rearing four species of egg parasites, and in general no great differences were observed in the rearings made under the various conditions. The area, weight, and volume of the host plant were used in the study of egg parasites. The minimum number of cages in a sample necessary for a given degree of accuracy was determined in a large number of collections and should serve as an index for future studies.

DN-Dust in control of the citrus red mite, A. M. BOYCE and J. F. KAGY. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 21 (1941), No. 4, pp. 5-6, 13, 19, 22, fig. 1).—In reporting further (E. S. R., 81, pp. 675, 676), it is pointed out that for the control of the citrus red mite the proprietary product DN-Dust has been widely used since 1938 with generally satisfactory results. The toxic ingredient in DN-Dust is dinitro-*o*-cyclohexylphenol ($C_{12}H_{14}N_2O_4$), described more specifically as 2,4-dinitro-6-cyclohexylphenol. The dust contains 1 percent of this chemical incorporated with a suitable diluent or carrier. The chemical is very toxic to the citrus red mite since 0.4 μ g. per square centimeter of surface will kill the adult, and it is also toxic to other mites and many species of insects. In the early studies with dust mixtures, it was found that the diluent or carrier must be slightly acidic, otherwise certain inorganic salts were formed that were less effective in control of the mite under field conditions. Walnut-shell flour was the most satisfactory dust diluent and was employed extensively until a more satisfactory volcanic ash material, Friarite, became available. After extensive field testing this pumiceous product was substituted for walnut-shell flour in DN-Dust mixtures for several reasons, but primarily because of its superior depositing qualities on the fruits and foliage.

The limitations of DN-Dust led to the development of an improved material known as DN-Dust D-8, which contains the dicyclohexylamine salt of this

chemical. This salt has several advantageous chemical properties and outstanding among these is the vapor pressure, which is lower than that of the parent compound. This property has important significance because the salt has been demonstrated to be much safer than the parent phenolic compound under conditions of high temperature on citrus and other subtropical plants, deciduous fruits, and certain truck and field crops. Furthermore, through the use of this salt instead of the parent compound, it is possible to include in the dust mixture certain adhesive agents such as oil, which enables better deposits of the dust with smaller quantities applied per tree. This factor has an important bearing on the dosage of material to be applied per tree, and the deposits obtained on mature fruits with the new material, which contains an adhesive agent, using a dosage of 1 lb. per tree, are as satisfactory as dosages of 1.5 lb. of the regular DN-Dust. This new dust (DN-Dust D-8) contains approximately 1.7 percent of dicyclohexylamine 2,4-dinitro-6-cyclohexylphenate. In many districts one application of DN-Dust often results in control of the citrus red mite for many months. One application kills the active stages of mites within 1 to 4 days, and those mites in the quiescent stage or molt at the time of treatment emerge within 3 days and are killed when they walk through the deposit of dust. Similarly the larvae that hatch from the eggs within 4 days after application are also killed. A second application of dust applied from 10 to 28 days after the first treatment kills those mites that were in the egg stage at the time of the first treatment.

Discussions of the methods of application, of its use in fall, winter, spring, and summer programs and the two general types of injury that have been observed are included.

Control of the citrus red mite, A. M. BOYCE and J. F. KAGY. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 6, pp. 154, 170-172, figs. 2).—These data are noted above.

The ilicis mite, injurious to trees and shrubs in California, R. H. SMITH. (Univ. Calif.). (6. *West. Shade Tree Conf., Oakland, 1939, Proc. Ann. Mtg.*, pp. 43-46).—Observations conducted in the vicinity of Los Angeles indicate that *Paratetranychus ilicis* McG., known as the sycamore mite or plane tree mite, is the most injurious species affecting trees and shrubs in California. It has been found to be generally distributed through the southern half of the State, where sycamore, camphor, eucalyptus, evergreen oaks, cypress, loquat, and English walnut particularly are attacked. Carob, pear, and quince are less commonly affected. The shrubs most severely attacked are cotoneasters, pyracanthas, and hollies. Tests have shown that infestations can be practically eradicated by repeatedly drenching trees with water, using a garden hose and sprinkler nozzle. Where water under pressure is not available, effective control can be accomplished by applying an oil spray, using a light medium oil emulsion at a dilution of 1½ gal. to 100 gal. of water.

ANIMAL PRODUCTION

Research in nutrition: Its contribution to livestock production, G. H. HAERT. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 131-135).—A general discussion of the need for and progress made in various phases of research in the advancement of methods and the importance of nutrition studies in the livestock industry.

[Experiments in livestock production by the Arizona Station] (*Arizona Sta. Rpt.* 1940, pp. 20, 46-50, 52-53).—Studies are reported on the comparative composition of waste lettuce and alfalfa; ration comparisons for fattening steers and heifers with and without silage and whole and ground alfalfa hay,

hegari v. Manko silage, whole cottonseed v. cottonseed meal, and ensiled grapefruit cannery refuse; adaptation of native and introduced grasses and crops for pasturage; carotene, Ca, and P analyses of range forage; and preferences and nutritive value of range plants for jack rabbits.

[Animal production studies by the Florida Station]. (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1940*, pp. 62, 63, 64, 66-68, 69-70, 71, 186, 194, 195, 211, 213).—Studies by W. M. Neal, R. B. Becker, P. T. D. Arnold, L. L. Rusoff, A. L. Shealy, R. M. Crown, W. G. Kirk, L. M. Thurston, N. R. Mehrhof, E. F. Stanton, D. F. Sowell, O. W. Anderson, Jr., J. C. Driggers, R. W. Kidder, and W. F. Ward are noted on ensilability of cowpeas and citrus products; carrying capacity and nutritive value of carpet grass pastures for yearling heifers; pastures and supplements for beef and dual-purpose cattle; deficiencies of peanuts when used as a feed for swine; relative growth of spring-farrowed and fall-farrowed pigs; shark-liver oil as a source of vitamin A for poultry; grazing crops for fattening feeder pigs; the comparative value of sugarcane silage, shocked sugarcane, and pasture supplemented with cottonseed meal or cake in wintering the beef herd; methods of feeding grain to layers; optimum level for feeding alfalfa leaf meal to hogs; oystershells and clamshells as calcareous mineral supplements for poultry; and fattening tests with poultry.

A study of various methods of preserving legumes and other forages by ensiling, B. C. JOHNSON, W. H. PETERSON, D. M. HEGSTED, and G. BOHSTEDT. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 6, pp. 337-348).—Data are presented on the dry-matter content, appearance, odor, preservation, ammonia: total nitrogen ratio, pH value, and carotene content of over 100 lots of legume and/or grass silage put up in various ways over a period of several years. The use of mineral acids (A. I. V. process), phosphoric acid, or molasses in suitable amounts generally resulted in good-quality silage. Among other less commonly used preservatives tested, including sulfamic acid, soured molasses, sodium chloride, and phosphorus pentasulfide, the whey powder, soured-whey concentrate, and corn meal gave the best results. Ensiling wilted legumes without the addition of a preservative generally resulted in poor-quality silage, leading to the conclusion that this method does not seem advisable as a practical farm procedure. Filling the silo with green material at such a rate that each layer reached and maintained a temperature of from 50° to 75° C. (Falavigna method) resulted in a silage of low acidity, very low carotene content, dark color, and disagreeable odor. There was considerable spoilage around the outside of the silo when this method was used.

Comparative feeding value of silages made from Napier grass, sorghum, and sugarcane, A. L. SHEALY, W. G. KIRK, and R. M. CROWN (*Florida Sta. Bul. 358* (1941), pp. 18).—In 3 years' trials of from 120 to 130 days' duration, sorghum silage proved superior to Napier grass and sugarcane silage when fed with ground snapped corn and cottonseed meal to yearling steers. By analysis, sorghum silage contained more dry matter, crude protein, and N-free extract, and the digestible nutrients were higher than in the other silages. Thus the average daily gains with sorghum silage of 2.08 lb. not only exceeded the rate of gain with other silages but less digestible nutrients were required per pound of gain, as follows: Sorghum silage, 6.16 lb.; sugarcane, 6.27 lb.; and Napier grass silage, 6.30 lb.

Increasing the feeding value of cereal straws, S. J. WATSON (*Jour. Roy. Agr. Soc. England*, 101 (1941), pt. 2, pp. 37-43, figs. 4).—The starch equivalent values of oat straw and wheat straw were more than doubled by 24 hr. of treatment with 1.5-percent solutions of caustic soda. A ration of 65 and 80 lb. of the pulp from oat straw with from 2 to 4 lb. of hay and 4 lb. of peanut cake produced gains of nearly 2 lb. per head daily in cattle. A similar group

which received dried beet pulp, grain, peanut cake, and bran made average daily gains of 2.36 lb. In another experiment, groups of heifers gained more than 1 lb. per head daily on rations containing oat and wheat straw pulp.

Sesame cake and antler growth, J. C. DRUMMOND, A. W. GREENWOOD, R. R. RIDGEWAY, and P. C. WILLIAMS (*Nature [London]*, 147 (1941), No. 3714, pp. 26-27).—Replacement of portions of the rations of capons and rats by sesame products showed no gonadotropic effects. It was therefore assumed that the stimulation to antler growth in deer from sesame products resulted from improvement in the nutritive balance of the ration, particularly in the amount of Ca supplied.

Commercial feeding stuffs—report on inspection, 1940, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 443 (1941), pp. 121-222).—In the usual manner (E. S. R., 84, p. 228) there are presented the guaranteed and found analyses of feeding stuffs, including vitamin D carriers, collected for official inspection during the calendar year 1940.

The efficiency of farm animals in the conversion of feedingstuffs to food for man, I. LEITCH and W. GODDEN (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun.* 14 (1941), pp. 64, figs. 8).—The efficiency of the total stock population of the United Kingdom calculated from various sources and based on the feed utilization by different classes of animals was estimated at 4.1 percent for dry matter, 8.7 for energy, 11.1 for protein, and 3.3 percent for fat. This efficiency was found to vary with species, age, and method of feeding and was determined by the analysis of the feeds and nutrients of the edible products. The production and livestock populations were estimated from the Ministry of Agriculture figures, importations, and reproduction for 1938.

Salt in livestock nutrition, G. BOHSTEDT. (Univ. Wis.). (*Southwest. Sheep and Goat Raiser*, 11 (1941), No. 8, pp. 11, 14-17).—A general discussion is given of the role of salt in livestock rations, including the salt content of feed and various animal products.

Distribution and concentration of copper in the newborn calf as influenced by the nutrition of the dam, L. L. RUSOFF (*Florida Sta. Bul.* 356 (1941), pp. 61, figs. 2).—Analysis of the tissues and organs of newborn calves from salt sick (E. S. R., 66, p. 59) and normal dams showed all tissues and organs to contain Cu. With the exception of skeletal structures, practically all of the tissues of a calf from a salt sick dam contained more Cu than comparable tissues from a calf with a normal mother. The total amount of Cu in the normal newborn calf was approximately 237 mg., as compared with approximately 270 mg. in the calf with a salt sick dam. The results suggest that bone may be the site of Cu storage, but Cu storage by the newborn calf was not influenced by salt sickness of the dam. At the same time, the calf from the salt sick dam was not salt sick, all of which suggested the possibility that some other factor may be required for Cu utilization. Data are included on the dry weights, moisture, and ash of the organs and tissues from each calf. Methods of Cu analysis are discussed with their possible utilization in relation to boron.

Beef cattle feeding investigations, Z. A. MASSEY (*Georgia Sta. Bul.* 211 (1941), pp. 19, figs. 7).—In 4 years' experiments of 112- to 140-day feeding periods in the different years, peanut meal and cottonseed meal proved approximately equal as supplements to corn and silage for yearling Hereford steers. Therefore the relative price of the two supplements should be the determining factor in their selection. Other comparisons between roughages showed ground peanut hay to produce average daily gains of 2.00 lb. per head for the four trials, as compared with 1.77 lb. for whole peanut hay, 1.75 lb. for silage, and 1.67 lb. when cottonseed hulls were employed as the roughage supplementing

corn and cottonseed meal. The advantages of grinding peanut hay for yearling steers thus depend on the relative cost of the grinding operation.

Effect of pasture on grade of beef, S. BULL, R. R. SNAPP, and H. P. RUSK (*Illinois Sta. Bul.* 475 (1941), pp. 225-256).—The results of cooperative studies on meats pertaining to the effects of pastures on quality at several of the experiment stations showed that cattle finished on pasture dressed and graded lower and had a higher shrinkage than cattle finished with grain and pasture. These results were largely accounted for by the lower fat and higher water content of the carcasses and the yellow fat of pasture-fed cattle. Cattle full-fed on pasture were equal in palatability and finish to cattle full-fed in dry lot, but the carcasses graded lower because of the presence of yellow fat. Finishing pasture-fed cattle in dry lot diluted but did not remove the yellow color. The color was not related to palatability. Studies were included of cattle carried on bluegrass, alfalfa, sweetclover, and bromegrass pastures with finishing on pasture and in dry lot. Investigations on the general subject of pasture finishing at other experiment stations are briefly reviewed.

Bean straw in the ration for fattening lambs in the Big Horn Basin, A. S. INGRAHAM (*Wyoming Sta. Bul.* 247 (1941), pp. 11, figs. 2).—Three years' experiments with lots of 40 range lambs each showed that bean straw fed with barley and dried beet pulp produced average gains of only 0.20 lb. per day, as compared with gains of 0.27 lb. per day by lambs fed the same rations except that alfalfa hay replaced the bean straw. On the other hand, when the roughage was made up of the two products in equal amounts, the average daily gains were 0.28 lb. When cured beet tops were fed with the bean straw, gains were increased to 0.23 lb. per day and the tendency to scouring from bean straw alone was alleviated. The lambs seemed to favor bean straw over alfalfa, but too large amounts caused scouring.

Body form in growing chickens, R. G. JAAP. (Okla. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 7, pp. 431-443).—Among 1,024 chicks of purebred White Leghorn and Plymouth Rock breeding and crossbreds between them, as well as crosses of hens of these breeds with Cornish ♂s, the ♂ chicks were heavier at 2 weeks of age than ♀s. Data on the relative growth and changes in shank length and shape ratio up to 24 weeks of age showed that the shank length increases ceased early. In ♂ and ♀ chicks, shank length increased with body growth only up to 16 and 12 weeks, respectively. Heritable differences in weight, body depth, and shank and keel lengths did not seem to detect differences in body conformation until from 8 to 12 weeks of age. The measurements employed for body shape roughly segregated the birds in these groups into four conformation classes. These were approached more accurately by measurements than by percentage of edible flesh. The Cornish as a breed seemed to bear plumpness characters and to transmit them to their progeny.

Purebreds vs. cross-breds as capons and roasters, E. W. HENDERSON and J. A. DAVIDSON (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 269-271).—Comparison of the weights of capon and cockerel progeny from White Leghorn, Barred Plymouth Rock, Rhode Island Red, and Dark Cornish fowls indicated that the Rock and Cornish strains have a slight advantage over the Leghorns and Reds in early growth, and at 24 and 36 weeks of age the White Cornish × Barred Rocks were heavier. The purebred and crossbred Cornish birds rated the best at 36 weeks of age. The dominance of pea comb of Cornish ♂s made the hybrids distinct.

Crossbreeding for broiler production, W. R. HORLACHER, R. M. SMITH, and W. H. WILEY (*Arkansas Sta. Bul.* 411 (1941), pp. 24, figs. 3).—Continuing these studies (E. S. R., 79, p. 319), 3 years' data on 10- and 12-week weights of the

same purebreds and crosses are given, with additional data on broilers from White Leghorn ♀ × Black Australorp ♂, Rhode Island White ♀ × White Wyandotte ♂, White Minorca ♀ × White Wyandotte ♂, White Wyandotte ♀ × White Australorp ♂, and crossbred ♀ (Rhode Island Red ♀ × White Wyandotte ♂) × White Rock ♂ produced in 1939. As in the previous report, the broilers from Rhode Island Red ♀ × White Wyandotte ♂ were superior to either parent in rate of growth, feed requirement, viability, and completeness of feathering. Because of the columbian color pattern the broilers were considered unfavorable for market production. The reciprocal cross made in only 1 yr. did not prove as satisfactory. In addition to this cross, White Leghorn ♀ × Black Australorp ♂, Barred Plymouth Rock ♀ × White Rock ♂ produced crossbreds that made significantly better growth records than either parent. In 4 of the 11 crosses the hybrids were noticeably superior to the purebreds in feed utilization. Although considerably better results were obtained from cross-breeding for broiler production, feed utilization, and viability, the unfavorable markets and lack of genetic purity of the breeds did not make it desirable to recommend specific crosses for broiler production.

Methods and rations for fattening poultry.—III, The effects of various fats, number of feedings, and length of fattening period, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr.*, 21 (1941), No. 6, pp. 350-357).—Yellow corn having been found to give the best all-around fattening results (E. S. R., 79, p. 92), various fats and oils as supplements to this ration were employed in comparing fattening of cockerels at 1, 2, and 3 weeks of age in individual cages. With rations to which there was added 10 percent of mutton fat, beef fat, or corn oil, range fattening was inferior to crate fattening, the gains in 3 weeks from range fattening being about equal to the gains in 1 week on the poorest of the fattening rations in cages. The differences were significantly greater with mutton fat in a 3-week fattening period than with corn oil or beef fat. Beef fat produced negligible gains during the third week, and corn oil resulted in lost weight. Mutton fat had a tendency to impart its flavor to the birds. Corn oil produced soft and oily fat. Two feedings per day proved as efficient as three. The 2-week fattening period was more economical than 1 week, but 3 weeks' fattening was not warranted for such birds as were in good condition at the start.

The vitamin D₃ requirement of pullet chicks: The relative values of genuine and a sample of controlled cod-liver oil in feeding poultry up to the age of 16 weeks, M. D. WRIGHT (*Jour. Agr. Sci. [England]*, 31 (1941), No. 1, pp. 161-170, pls. 2).—Considering both growth and optimum calcification, the D₃ requirement of chicks was not far from 1 British Standards Institution unit per gram of ration consumed. Growth and calcification were determined in birds from 1 day to 6 weeks of age and from 6 to 16 weeks for the effects of crystalline cod-liver oil making up different proportions of the grain and mash. The Ca:P ratio covered a wide range from 0.5 to 1.39. In general, the genuine cod-liver oil produced better calcification than the crystalline substance, and the poorer calcification was especially noticeable when better rates of growth were made. Two-thirds of 1 percent of genuine cod-liver oil produced calcification as satisfactorily as 1 percent of the crystalline product.

Evidence of a sex differential in the utilization of shell calcium by the chick embryo, I. L. KOSIN and S. S. MUNRO (*Sci. Agr.*, 21 (1941), No. 6, pp. 315-319).—As was suggested in the previous study,^{*} the heavier weights of ♂ than ♀ chicks at hatching were apparently due to the fact that ♂ chicks draw more Ca from the shell. White Leghorn eggs showed a difference in the shell weights

^{*} *Sci. Agr.*, 20 (1940), No. 10, pp. 596-591.

after hatching of 0.16 percent between the two sexes, whereas the difference in Barred Plymouth Rock eggs was 0.12 percent. Sex differences in the weights of the embryos were apparent at the eighteenth day of incubation. The greater utilization of shell in bone formation in the ♂ does not account for all of the difference in weight, but the larger bones were undoubtedly accompanied by heavier muscles and viscera.

The influence of cereal grains upon the quality of meat in turkeys, M. O. NORTH (*Wyoming Sta. Bul.* 248 (1941), pp. 20, figs. 2).—In a comparison of the effect of grains as 55 percent of an all-mash ration on the rate and quality of gains in turkeys it was found that yellow corn and wheat, when fed singly from 8 to 26 weeks of age, produced better-fleshed carcasses than barley, oats, and rye. At the same time, rye rated high in the rate of gains produced. When the grains were compared only during the finishing period from 19.5 to 26 weeks, there were no significant differences in the effects of the different cereals. The 45-day finishing period was sufficiently long to change the type of body fat, and softer fats were produced by oats and corn, with rye intermediate to the harder fat of barley and wheat. The more intense flavor and aroma of oat-fed roasted birds was lost after 5 mo. of frozen storage, and no significant differences were apparent. Corn-fed birds were more tender after roasting. None of the grains showed decided superiority or inferiority in the color of the meat produced after roasting. The experiment was conducted with five lots of 30 birds throughout the growing period, and similar numbers of fowls fed during the finishing periods.

A preliminary experiment upon boning, curing, smoking, and cooking turkey meat, J. A. DAVIDSON, P. J. SCHABLE, and R. PILLAR (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 230-232, fig. 1).—Seven hen turkeys boned, smoked, and cooked by methods previously described (*El. S. R.*, 85, p. 237) gave an average recovery of 42.3 percent of the live weight in the final cooked product. The loss in each operation was recorded for each bird.

DAIRY FARMING—DAIRYING

[Dairy investigations in Arizona] (*Arizona Sta. Rpt.* 1940, pp. 57-61).—Results are briefly presented on the normal live weight trends in growing dairy heifers and lactating cows, influence of season on butterfat percentage, seasonal variations in the composition of Sudan grass and barley pasture clippings, factors influencing the solids-not-fat content of milk, and the effect of exposure of cows to sunlight on the vitamin D potency of their milk.

Individuality of digestive power in dairy cattle [trans. title], F. JARI (*K. Läntr. Akad. Tidskr.*, 80 (1941), No. 2, pp. 147-160; *Eng. abs.*, p. 159).—The results are presented for two series of digestion experiments, each with 12 cows receiving identical rations which consisted of 8 kg. of hay and 4 kg. of a concentrate mixture per cow daily. Each experiment extended over 15 days, providing 5 coefficients of digestibility, calculated by 3-day periods, for each cow in each series. The coefficient of digestibility of the total organic matter averaged 68.1 percent (range 66.2-69.7) in the 1939 trial and 70.0 percent (range 67.7-71.7) in the 1940 trial. A statistical treatment of the data indicated a significant difference between cows in their ability to digest the organic matter of the same feed mixture. The correlation between the digestion coefficient of the seven cows used in both series was 0.807, which was statistically significant.

The pH values of the ingesta of the rumen of slaughtered animals, T. M. OLSON. (*S. Dak. Expt. Sta.*). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 413-416).—A total of 473 samples of bovine rumen contents showed an average pH value of 6.859 (range 5.52-7.78). The time elapsed between time of collection and the

pH determination ranged from 5 to 45 hr. Samples allowed to remain in the laboratory at room temperature showed an appreciable increase in alkalinity on standing. Identification of the sources of feed was not sufficiently positive to permit definite conclusions on the effect of feed on pH of the rumen content. When only hay and straw were present in the rumen, pH values tended to range above the average of the entire lot, as was true when green grass had been fed. No significant differences in pH values were observed which could be attributed to the type, age, sex, or condition of the animal.

The feeding value of grass silage in the ration for dairy cows, O. L. LEPAED and E. S. SAVAGE. (Cornell Univ.). (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 549-560).—The results of four feeding experiments with milking dairy cows are reported. In the first, a triple reversal experiment, the roughage fed consisted of (1) 3 lb. of corn silage and 1 lb. of mixed hay per hundredweight daily, (2) 3 lb. of corn silage, $\frac{1}{2}$ lb. of mixed hay, and 2 lb. of molasses silage (grass, clover, and alfalfa) per hundredweight daily, and (3) 2 lb. of corn silage, $\frac{3}{4}$ lb. of mixed hay, and 2 lb. of molasses silage (as above) per hundredweight daily. An 18-percent protein concentrate mixture was fed according to production in all cases. The estimated total digestible nutrient intake was 16.4, 14.9, and 15.6 lb. per cow daily, and the average production of 4-percent fat-corrected milk was 25.1, 25.5, and 26.3 lb. per cow daily on rations 1, 2, and 3, respectively. In a continuous trial of 12 weeks' duration the molasses silage was fed as the only roughage to 11 cows. Average daily silage consumption was 71.77 lb. per cow, which had to be supplemented with 16.44 lb. of concentrate to maintain live weight and normal persistency of milk production. Experiments 3 and 4 were designed to compare molasses silage with phosphoric acid silage (grass, clover, and alfalfa in each case). Each experiment was of the single reversal type. In the third trial 3 lb. of grass silages and 3 lb. of corn silage were fed per 100 lb. of live weight daily, while in No. 4 3 lb. of the grass silages and 1 lb. of mixed hay were fed per hundredweight daily. Whether fed with corn silage or cured hay the molasses and phosphoric acid silages proved to be practically equal in feeding value.

Utilization and excretion of ascorbic acid by the dairy cow, C. A. KNIGHT, R. A. DUTCHER, N. B. GUERREANT, and S. I. BECHDEL. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 567-577, fig. 1).—Excretion of ascorbic acid in dairy cows was studied by the simultaneous application of the indophenol titration and the furfural method of analysis of freshly excreted samples of urine. The ascorbic acid was found to be excreted in reduced form, but it proved to be impractical, if not impossible, to preserve the ascorbic acid in reduced form in complete collections of urine over 24-hr. periods. The ascorbic acid content of the plasma in normally fed Holstein cows ranged from 0.43 to 0.62 mg. per 100 cc. When as much as 100 gm. (2,000,000 International Units) of ascorbic acid per day were administered to cows for 3 days in their silage ration, in gelatin capsules, or in aqueous solution, no increase in the ascorbic acid of the milk or blood, and only a slight increase in the urine, resulted. Subcutaneous or intravenous injection of ascorbic acid resulted in significant increases of this material in the milk, blood, and urine. By removal of the rumen content through a fistula at regular intervals after feeding ascorbic acid, a marked and rapid destruction of the product in the rumen could be demonstrated. When rumen juices were mixed with ascorbic acid and stored in dark receptacles at 39°-42° C., the ascorbic acid disappeared at about the same rate as in the in vivo experiments.

Useful life-span of Holstein bulls, R. B. BECKER and P. T. D. ARNOLD. (Fla. Expt. Sta.). (*Holstein-Friesian World*, 38 (1941), No. 6, pp. 78-79).—Records

of 272 Holstein bulls in active service for at least 5 yr. were included in this analysis. Of this total 223 were in service for 8 yr., 157 for 10, 84 for 12, 10 for 15, and 1 for 17 yr. Sterility accounted for the termination of usefulness in over one-fourth of the cases. Infectious diseases, old age, accidents and injuries, foreign bodies, and lameness were other important causes of this disability.

Storage of dairy bull spermatozoa, E. W. SWANSON and H. A. HERMAN. (Univ. Mo.). (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 579-587, figs. 3).—Continuing this field of investigation (E. S. R., 85, p. 330), studies were conducted on the influence of different storage temperatures and the use of various diluents on the longevity and motility of spermatozoa. A temperature of 40° F. proved entirely satisfactory for storage of semen, while room temperature and near-freezing temperature were undesirable, particularly the former. Glucose solutions and Milovanov's S-G-C-2 dilutor were of no value in increasing the length of survival time in stored bull semen. Egg-yolk buffer dilutor, when used either on the normal semen or semen in which the sperm fluid has been removed by centrifuging, was very effective in maintaining vigorous motility for the first 100 hr. The other diluents were of no value in maintaining motility in the centrifuged samples. Good-quality semen survived longer when stored undiluted than when any of the diluents were added to it. Because of the low ratio of pregnancies resulting from the use of semen stored longer than 2-3 days, the practicability of using such semen was questioned.

The pH of vaginal mucus of normal and sterile dairy cows, S. E. SMITH and S. A. ASDELL. (Cornell Univ.). (*Amer. Jour. Vet. Res.*, 2 (1941), No. 3, pp. 167-173, 174, figs. 3).—Using a glass electrode with a Beckman pH meter, the pH of the vaginal mucus was determined in over 30 mature Holstein cows, all of which were free from Bang, trichomonad, and tuberculosis infection. With the exception of two isolated cases, the pH ranged from 7.0 to 8.9 and averaged 7.9. The pH in sterile cows did not differ significantly from the values found in normal individuals. Values varied with the oestrous cycle, being high during dioestrus and oestrus and low during metoestrus. Since the mucus of the cervix was found to be more acid than that of the vagina, it is suggested that the flowing away of the cervical mucus at oestrus may account for the decrease in vaginal pH immediately following oestrus. Doses as high as 50,000 rat units of an oestrogenic hormone failed to produce an acid vaginal reaction in four individuals.

Evidence for the presence of smooth muscle elements surrounding the alveoli of the mammary gland, E. W. SWANSON and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 635-638, fig. 1).—Histological examination of tissues from the udder of a lactating cow revealed the presence of cells beneath the secretory epithelium of the alveoli in the interlobular spaces which had the appearance and staining properties of smooth muscle fibers. It is the opinion of the authors that these cells surround the alveoli and aid in the expulsion of milk from the lumen.

Improvement in the Chatham dairy herd, J. G. WELLS, JR., and R. E. HOBWOOD (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 267-269).—A brief history of this purebred Holstein herd, including average production records from 1924 to 1941, and information on the average production of the daughters of 12 herd sires which have been used since the herd was established in 1912.

The cattle of India and their development, F. WARE (*Empire Jour. Expt. Agr.*, 9 (1941), No. 33, pp. 1-11, pls. 6).—A brief discussion of the existing types of cattle in India and measures adopted for their improvement.

The composition and properties of goats' milk, G. M. TROUT (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 254-264, fig. 1).—Included in this report are information on the composition of goats' milk compiled from the literature and data on the fat, solids-not-fat, total solids, ash, specific gravity, pH, titratable acidity, and flavor score of 40 samples of goats' milk submitted by Michigan producers in the 1940 National Goat Milk Scoring Contest. Breed differences in milk composition are indicated. Twenty references to the literature are cited.

Care of milking machines, C. K. JOHNS (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 409-411).—In this critique of an article by Mallmann, Bryan, and Begeman (*E. S. R.*, 84, p. 97) the author cites evidence to indicate that milking machine tubes can be kept in a good sanitary condition by filling them with lye solution following a cold water rinse. The justification for using an additional rinse with hot detergent solution as recommended by Mallmann et al. is questioned.

The role of acid cleaning agents in dairy detergency, M. E. PARKER and G. W. SHADWICK, JR. (*Amer. Butter Rev.*, 3 (1941), No. 6, pp. 206, 208, 210, 212).—This article discusses the relative merits of alkali and acid cleaning agents. The data presented indicate the desirability of using an acidified steam rinse in the cleaning of milk cans. The survival of proteolytic, alkali-forming, and oxidizing types of bacteria was markedly reduced by such a practice. In the opinion of the authors, the application of wetting agents in combination with acid-reacting substances has resulted in acid cleaning compounds possessing greater detergency than most alkaline products, with a lack of any appreciable corrosiveness, and both corrective and curative of milkstone formation. The use of such compounds promises to bring about a marked revision in dairy cleaning practices (*E. S. R.*, 85, p. 520).

The instantaneous heat treatment of milk, G. C. SUPPLEE and O. G. JENSEN (*Jour. Milk Technol.*, 4 (1941), No. 1, pp. 5-17, figs. 7).—Quantitative data were secured on the extent of bacterial reduction, phosphatase destruction, and cream-line reduction when milk was subjected to different rates of flow and temperatures using the flowing-film electric pasteurizer and aerator. Excellent bactericidal efficiency resulted in samples heated momentarily to 180° F. or higher. Samples exposed to a lethal temperature range of 145°-185° for only 0.8 sec. showed bacterial destruction equal to or in excess of that usually obtained by the established milk-pasteurization methods. At a temperature of 177°, 30 percent of the samples were classified as slightly underpasteurized according to the phosphatase test, while at 181° all samples were classified as satisfactorily pasteurized. The creaming properties of milk were only slightly reduced at temperatures of 161°-180°, but were markedly reduced at higher temperatures. The natural fresh raw-milk flavor was retained to a remarkable degree at all temperatures up to 185°.

The effect of pasteurization on Esch[erichia] coli in milk and ice cream mix, C. PALEY and M. L. ISAACS (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 421-427).—Parallel tests were conducted in which sterile whole milks and sterile commercial ice cream mixes inoculated with standardized amounts of *E. coli* cultures were sampled for plating at 10-, 20-, 25-, 30-, and 35-min. exposures to a temperature of 143° F. The results of plate counts indicated that ice cream mixes exerted a protective action for this pasteurization temperature, the apparent resistance of the organisms being approximately doubled. When single ingredients of ice cream were added to milk, it appeared that butter, sugar, flavor, color, or gelatin exerted little or no protective effect, while the stabilizers, locust bean gum and sodium alginate, were effective, indicating that

these were the substances responsible for the protection in commercialized ice cream.

Deaeration as a means of retarding oxidized flavors and preserving the vitamin C of milk, P. F. SHARP, E. S. GUTHRIE, and D. B. HAND. (Cornell Univ.). (*Jour. Milk Technol.*, 4 (1941), No. 3, pp. 138-143).—A report of research noted previously (E. S. R., 84, p. 810) and published in greater detail elsewhere (E. S. R., 85, p. 524).

The angle sanitary fitting, P. F. SHARP. (Cornell Univ.). (*Jour. Milk Technol.*, 4 (1941), No. 3, pp. 144-146, fig. 1).—An angle sanitary fitting is described which was developed in connection with the designing of equipment for the deaeration of market milk where some of the unions are subjected to a vacuum and must not leak.

Tables and nomograph for Sharp and Hart's equation for the calculation of total solids in milk, L. M. LAMPERT (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 417-420, fig. 1).—This equation has been noted (E. S. R., 76, p. 844).

The effect of cocoa upon the digestibility of milk proteins, L. D. LIPMAN and W. S. MUELLER. (Mass. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 399-408).—By means of feeding trials with albino rats the digestibility of the proteins was studied in (1) a basal diet of whole milk powder 62.9, cane sugar 33.1, and salt mixture 4; (2) one containing whole milk powder 52.6, Dutch-process cocoa 15.8, sugar, and salt; (3) the same as diet 2 except that American-process cocoa was used instead of the Dutch-process; and (4) one containing whole milk powder 48.7, American-process cocoa 14.6, cocoa fat 7.1, sugar, and salt. The rats were able to digest approximately 85, 69, 71, and 71 percent of the total food proteins in rations 1 to 4, respectively. It is calculated that the digestibility of the milk protein was reduced 7.8, 6.0, and 5.8 percent in rations 2, 3, and 4, respectively, as compared with that of the basal diet, and that the digestibility of the cocoa proteins was 38.1, 44.5, and 41.1 in these rations. It is concluded on the basis of these data that the amount of cocoa in average commercial chocolate milk, which approximates 1 percent by weight, has no significant adverse effect upon the digestibility of the milk proteins.

Effect of free fat acids of milk fat on curd tension of milk: Relation to milk esterase, temperature, use of CaCl_2 , kind of fat acid, milk lipase, and churning, L. S. PALMER and C. L. HANKINSON. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 429-443).—Continuing this line of investigation (E. S. R., 84, p. 238), it was demonstrated that raw milk and whey contain an esterase or esterases which accelerate the hydrolysis of diglycol laurate, diglycol oleate, and other esters at temperatures below 10° C. These could be removed by ultra-filtration and inactivated by heat. The clotting of milk by rennet was interfered with or entirely inhibited when, under proper conditions, the fat acids from diglycol laurate or diglycol oleate were added directly to the milk or liberated in the milk by enzyme activity. Capric acid exerted a like effect. The adverse effects of the saturated fat acids occurred only after a period of aging at reduced temperature and addition of rennet at 35° or lower. Heat treatment for 30 min. or more at 40° completely reversed the effect, and several hours' heating at 35° caused some reversal. The adverse effects of oleic acid occurred without aging and were not overcome entirely by heat treatment. The addition of CaCl_2 to milk overcame the clot-preventing effect of lauric acid. Lipolysis induced in raw whole milk by agitation at proper temperature and subsequent holding at low temperature reduced the tension of the rennet curd. Similar lipolysis was not necessarily induced in raw cream by churning, but the curd tension of the butter-milk from such cream was consistently low.

Dissimilation of citric acid by *Streptococcus paracitrovorus*, C. R. BREWER and C. H. WEBERMAN. (Iowa Expt. Sta.). (*Antoine Van Leeuwenhoek*, 6 (1939—

40), No. 2, pp. 110-120, figs. 4).—Quantitative determinations were made of the fermentation products when *S. paracitrovorus* was grown on different substrates. Little gas production occurred when sodium citrate, glucose, or lactose was used singly to supplement the basic yeast extract medium, but a combination of citrate with either glucose or lactose resulted in rapid and large gas evolution, accompanied by a marked dissimilation of citric acid. The effect of glucose or lactose in initiating the dissimilation of citric acid proved to be catalytic, the sugars themselves being fermented to approximately equimolar quantities of carbon dioxide, ethyl alcohol, and lactic acid. In addition, the dissimilation of such a combined substrate gave acetic acid, acetylmethylcarbinol, 2,3-butylene glycol, and, under certain conditions, pyruvic acid. The fermentation of citric acid proceeded anaerobically, consumed little oxygen under aerobic conditions, and was not inhibited by the presence of arsenite. Inasmuch as milk contains lactose, it was shown that the fermentation of citric acid in milk by *S. paracitrovorus* may be catalyzed.

Studies on the phosphatase test and its application to processed and treated milks, N. A. PERRY and F. J. DOAN. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 369-382, figs. 4).—Studies on the adaptability of the photoelectric colorimeter indicated that it offers a convenient and accurate means of determining the intensity of color produced when the Schärer modification of the phosphatase test is applied to milk. It is recommended that a filter be used which excludes practically all light except that in a narrow band having a medium wave length of 600 μ . The necessity of carefully controlling the period of time allowed for color development in the standard phenol solutions is stressed. It was found that phosphatase tests on milk samples containing relatively small amounts of active phosphatase increased in color intensity for at least 60 min., while more concentrated solutions required a shorter time to reach a maximum color, thus indicating the necessity of allowing a uniform carefully controlled period of time for color development in the performance of the test. When the above precautions were followed, the test proved capable of detecting too low a temperature of one degree when the pasteurization standard was 143° of 144° F. and of two degrees when the standard was 145°. As little as one-tenth of 1 percent of raw milk could be detected when added to milk assumed to have been pasteurized at any specific temperature between 142° and 145° for 30 min. The accuracy of the phosphatase test as applied to pasteurized milk was not significantly affected by reinforcement of milk with vitamin D either by irradiation or by the addition of vitamin D concentrates; addition of pancreatic extract (Enzylac) for producing a soft-curd type of milk or for preventing oxidized flavor; contamination with such metallic ions as copper, nickel, iron, aluminum, or tin in concentrations up to 10 p. p. m.; development of oxidized flavor; homogenization; or storage under refrigeration for periods as long as 6 days.

Vitamin D in milk: A review, K. G. WECKEL. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 445-462).—A comprehensive review, with 95 references to the literature.

Mastitis.—I, The relationship of the development of mastitis to changes in the chlorine, lactose, and casein number of milk, A. H. VANLANDINGHAM, C. E. WEARLEY, JR., E. N. MOORE, and H. O. HENDERSON. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 5, pp. 383-398).—The results obtained from approximately 250 udder examinations on 40 purebred Holstein cows form the basis of this report. Chemical studies were supplemented by physical examination of the udders, and diagnostic tests included strip cup, bromothymol blue, and Hotis, chlorine (colorimeter) determinations, microscopic examination of incubated milk, leucocyte count, and blood agar plate. The foremilk from individual

quarters free from mastitis contained from 0.09 to 0.224 percent chlorine (average 0.124) and from 3.3 to 5.4 percent lactose (average 4.788). The chlorine-lactose number varied from 1.62 to 6.70 (average 2.614) and the casein number from 69.4 to 84.3 (average 77.37). Milk from quarters in advanced stages of mastitis showed higher chlorine, lower lactose, higher chlorine-lactose number, and lower casein number than milk from normal quarters. The mean difference between quarters in normal udders free from mastitis was for chlorine content 0.0065 percent, lactose 0.115 percent, chlorine-lactose number 0.184, and casein number 0.999. Statistical treatment of the data indicated that for a significant difference between normal quarters and affected quarters there must be a difference of at least 0.02 percent chlorine, 0.36 percent lactose, 0.60 for the chlorine-lactose number, and 2.90 for casein number when samples of 6-8 oz. of milk were used. Marked bacteriological changes in the foremilk usually occurred before a change in the chemical composition of the milk was apparent. In the opinion of the authors these indirect biochemical tests when based upon quarter differences in the same udder can be recommended for the diagnosis of chronic mastitis, although they will not indicate quarters which show chronic mastitis in the incipient stages.

A simplified procedure for the laboratory examination of raw milk supplies. R. P. MYERS and J. A. PENCE (*Jour. Milk Technol.*, 4 (1941), No. 1, pp. 18-25, figs. 5).—The method, designed to test milk for the presence of thermophilic organisms, consists of the laboratory pasteurization of 5-cc. samples at 143° F. for 30 min., shaking the heated samples vigorously 50 times, and then transferring a standard loopful of the milk sample to an oval culture tube containing 4 cc. of sterile melted tryptone-glucose-extract agar. After solidifying in a slanted position the tubes are incubated at 36°-37° C. for 48 hr., and the colony counts made in the usual manner. Data are presented to show that the tests gave reliable counts on the pasteurized samples, and examples are described showing how this procedure of locating producers supplying milk contaminated with thermophilic bacteria may be applied in a milk-quality control program.

To what extent should bacterial counts of milk be given publicity? C. C. PROUTY. (Wash. Expt. Sta. and State Col.). (*Jour. Milk Technol.*, 4 (1941), No. 1, pp. 32-37).—This paper, with a discussion by M. E. Parker (pp. 35-37) which follows, presents reasons why bacterial counts of milk should not be given publicity to the milk-consuming public.

The maintenance of pure cultures of lactic acid bacteria. J. G. DAVIS (*Dairy Indus.*, 6 (1941), No. 1, pp. 8-10).—The principal topics considered in this discussion are the isolation of various types of lactic acid bacteria, the routine maintenance of type cultures, choice of media, frequency of transfers, detection of contamination, and purification of contaminated cultures. Seventeen references are cited.

Neutralization of sour cream for buttermaking. I, II (*Jour. Dept. Agr. Victoria*, 39 (1941), Nos. 3, pp. 145-148; 5, pp. 232-236, figs. 4).—These reports are based on research at the School of Dairy Technology, Werribee.

I. Estimation of acidity of cream. F. S. J. Newman and W. J. Wiley.—A study of factors affecting the accuracy of acidity determinations in sour cream by the titration method indicated that exact measuring of the sample and elimination of carbon dioxide by boiling were essential. The recommended procedure is to take 18 gm. of cream (or 18 cc. if the cream in the vat is measured volumetrically), add 18 cc. of water, boil the mixture gently for 2 min., add 5 or 6 drops of 5-percent phenolphthalein solution, and add standard alkali until the first perceptible tinge of pink color appears.

II. The titratable acidity of cream and buttermilk and the pH of butter. W. J. Wiley and F. S. J. Newman.—Data are presented to indicate that a reasonably

close correlation exists between the titratable acidity and the pH of raw cream, of neutralized cream, and of buttermilk. Some correlation was found also between the pH of the cream and of the butter and buttermilk made from it. Precautions in using cream acidity as a criterion of butter pH are discussed.

The "sectional contamination" defect in butter, T. M. JENSEN (*Jour. Dept. Agr. Victoria*, 39 (1941), No. 6, pp. 283-288).—Defective areas in butter packed in the conventional wooden butter boxes were not encountered in freshly made butter, but frequently developed within 3 or 4 days in butter held at 40° to 50° F. Affected areas were found to be very high in bacterial count, and the defect could be reproduced by inoculating small amounts of defective butter into packages of freshly made butter. Packing tools and water proved to be important sources of contamination. Chlorination of water supplies and adequate heat treatment of utensils were effective control measures.

Effect of proteolysis on lipase induced rancidity in Cheddar cheese, I. HLYNKA, E. G. HOOD, and C. A. GIBSON (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 561-565).—In experiments at the Department of Agriculture, Ottawa, Cheddar cheeses were manufactured in which normal and above-normal amounts of rennet, pepsin, or the two in combination, were used, plus additions of 2.5-5 gm. of lipase per 1,000 lb. of cheese milk. Flavor scores made after varying periods of curing gave evidence that rancid or other less-defined flavors were reproduced in the cheese by the addition of lipase. A higher flavor score resulted when the above-normal amounts of rennet or pepsin were used than from the same batches of milk when smaller amounts of the proteolytic enzymes were added. The probable beneficial proteolytic functions of the rennet enzymes under such conditions are discussed.

The control of "early gas" in brick cheese, J. C. GAREY, E. M. FOSTER, and W. C. FRAZIER. (Univ. Ill. and Wis.). (*Jour. Bact.*, 41 (1941), No. 4, p. 547).—When good-quality raw cheese milk was inoculated with 0.0025 percent of a culture of *Aerobacter aerogenes*, brick cheese manufactured from it showed the typical early gas defect at the fourth to sixth hour after dipping. When the same milk was inoculated with 1.5 percent of either *Streptococcus lactis* or *S. thermophilus* starters, or 1.5 percent of each in combination, and the curd cooked at 106° F. the early gas defect occurred between the sixth to eighth hour after dipping, indicating that the activity of *A. aerogenes* bacteria was inhibited only slightly. When, under the above conditions, a cooking temperature of 112° was used, this defect was present to only a small degree, and at 120° it was entirely absent. After curing, the flavor of the two lots of brick cheese subjected to the higher temperatures was sweet and mild and showed none of the undesirable off-flavors usually associated with the development of *A. aerogenes*.

Factors affecting the activity and heat resistance of Swiss cheese starter cultures, III, IV, H. J. PEPPLER and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 603-610, 611-623).—Two added reports in this series (E. S. R., 82, p. 247) are noted.

III. Effect of variations in time and temperature of incubation and of storage on activity of cultures.—When carried continuously at either 37°, 40°, or 42° C., mother cultures of *Lactobacillus helveticus* and *Streptococcus thermophilus* transferred after 24 hr. showed as great culture activity as those transferred after 12 hr. Cultures of *S. thermophilus* behaved similarly when incubated continuously at 45°, but cultures of *L. helveticus* grew irregularly and poorly after successive transfers at this temperature. After incubation at 37° from 12 to 16 hr., or 42° from 12 to 24 hr., cultures of *L. helveticus* could be stored at 0° to 20° until they were 96 hr. old without reduction in activity. Similarly, cultures of *S. thermophilus* incubated at 37° from 9 to 16 hr., or 42° from

12 to 24 hr., could be held at 0° or 20° until they were 96 hr. old without becoming less active than cultures transferred every 12 hr. at 37° or 42°.

IV. *Effect of variations in time and temperature of incubation and of storage on heat resistance of cultures.*—Incubation and storage temperatures were shown to influence markedly the heat resistance of the cultures. Mother cultures of *L. helveticus* grown in freshly reconstituted skim milk and transferred every 12 to 24 hr. were more heat resistant when incubated at 40° than at 37°. When the medium was supplemented with such accessory substances as Neopeptone or malt extract, cultures of both *L. helveticus* and *S. thermophilus* showed greater heat resistance when transferred at 12 to 24 hr. at 37° or after 12 hr. at 40°. Storage at 12° was least harmful to *L. helveticus* following incubation at 37°, greatest heat resistance being observed when those transferred after 12 hr. were held no longer than 60 hr. and the 24-hr. cultures held no longer than 48 hr. at the low temperature. Such cultures incubated at 40° for 8 to 15 hr. could be held at 20°, 12°, or 4° until they were 48 hr. old. The 12° temperature was the least harmful of the three. *S. thermophilus* grown in the fortified medium at 37° for 10 to 12 hr., then stored 84 hr. at 12° or 36 hr. at 4°, and 24-hr. cultures at 37° held 24 hr. at 12° were as heat resistant as those transferred every 12 hr. at 37°. When grown at 40° cultures of this organism were heat resistant only when Neopeptone was added to the medium. Such cultures could be successfully held at 12° or 4° until they were 48 hr. old. Mixed cultures of the film yeast *Candida krusei* and *L. helveticus*, or *S. thermophilus*, exhibited greater heat resistance than pure cultures of either of the bacteria. Frequent transfers of the associated cultures reduced the influence of the "mycoderm" on the former but not on the latter bacteria. In old cultures bacteria nearest the mycoderm film grew and fermented better following heat treatment than bacteria in areas farthest removed from the pellicle formed by the film yeast.

Smoked cheese making, J. C. MARQUARDT. (N. Y. State Expt. Sta.). (*Amer. Butter Rev.*, 3 (1941), No. 4, p. 157).—A résumé of information previously noted (E. S. R., 77, p. 845), with a note on making Provolone-type cheeses.

A study of homemade ice cream, V. D. FOLTZ and W. H. MARTIN. (Kans. Expt. Sta.). (*Food Res.*, 6 (1941), No. 1, pp. 31-38).—One hundred samples of home-made ice cream were collected from September 1938 to June 1939 from 40 housewives in Manhattan, Kans. The reasons and number of times mentioned for making the home-made product were economy 55, taste 34, convenience 25, and safety 15. Milk and cream, with unpasteurized predominating over pasteurized samples, were the milk products used, and the two methods of freezing employed were the tub method and freezing in a mechanical refrigerator, with or without stirring. Butterfat and total solids in the 100 samples varied, respectively, from 1.4 to 35.4 and from 17.8 to 53.4 percent. Bacteria counts on these samples have been described previously (E. S. R., 83, p. 394).

VETERINARY MEDICINE

[Abstracts of contributions in animal pathology and parasitology] (3. *Internatl. Cong. Microbiol.*, New York, 1939, Abs. Commun., pp. 22-23, 84-86, 91-95, 114-115, 116-117, 118-120, 121-122, 129-131, 136, 139-140, 144, 146-147, 168, 169, 171-172, 174, 177-178, 186-187, 263, 264, 270-271, 272-274, 291-292, 294-295, 297, 299).—Abstracts, the contributions of which have been noted (E. S. R., 83, p. 819).

Relation of soil and plant deficiencies and of toxic constituents in soils to animal nutrition, L. A. MAYNARD. (Cornell Univ.). (In *Annual Review of Biochemistry*, X, edited by J. M. LUCK and J. H. C. SMITH. Stanford University,

Calif.: Ann. Rev., Inc., 1941, vol. 10, pp. 449-470).—A review of the work in this field reported in 1940, presented with a list of 105 references to the literature cited.

[Proceedings of the forty-first, forty-second, and forty-fourth annual meetings of the United States Live Stock Sanitary Association, 1937, 1938, and 1940] (*U. S. Livestock Sanit. Assoc. Rpts.*, 41 (1937), pp. VIII+249-480, figs. 16; 42 (1938), pp. VIII+251, figs. 6; 44 (1940), pp. IX+223, figs. 3).—Among the contributions presented at these meetings of the association, of which the 1939 report has been noted (*E. S. R.*, 83, p. 677), are:

1937.—Protective Immunization in Swine Diseases, by H. C. H. Kernkamp (pp. 310-316) (*Univ. Minn.*); Swine Erysipelas, its Distribution, Increasing Importance, and Control, by F. Breed (pp. 344-355); Differential Diagnosis of Respiratory Diseases of Poultry, by F. R. Beaudette (pp. 389-402) (*N. J. Expt. Stas.*); Erysipelas Outbreaks in Turkey Flocks, by H. Van Roekel, K. L. Bullis, and M. K. Clarke (pp. 403-418) (*Mass. Sta.*); and Some Observations on Morphological Forms Found in the Growth of Tubercle Bacilli and the Relationship of Such Studies to Future Research Work, by E. W. Bond (pp. 453-469).

1938.—The Control of *Brucella* Agglutination Antigen by Means of Dried Serum, by R. M. Chapin, J. M. Schaffer, and P. W. LeDuc (pp. 31-38) (*U. S. D. A.*); *Brucella* Infection in Swine, by S. H. McNutt (pp. 90-97) (*Iowa State Col.*); A Review of the 1938 Outbreak of Infectious Equine Encephalomyelitis in the United States, by M. S. Shahan, L. T. Giltner, and H. W. Schoening (pp. 145-157) (*U. S. D. A.*); Massachusetts Experiences an Invasion of Equine Encephalomyelitis, Eastern Type, by C. F. Riordan (pp. 157-160); Progress in Pullorum Disease Control and Eradication, by H. Van Roekel (pp. 162-170) (*Mass. Sta.*); Wheat Germ Oil in the Control of Fowl Paralysis and Kindred Diseases, by E. Jungherr (pp. 171-180) ([Conn.] Storrs Sta.); Investigations of Pox in Canaries, by A. J. Durant and H. C. McDougle (pp. 181-188) (*Univ. Mo.*); Method and Practical Application of Egg Propagated Avian Viruses, by G. L. Dunlap (pp. 188-193); and Newer Knowledge of Poultry Parasites, by J. E. Ackert (pp. 197-208) (*Kans. State Col.*).

1940.—Field Tests of Crystal-Violet Vaccine for the Prevention of Hog Cholera, by C. G. Cole and C. N. McBryde (pp. 17-28) (*U. S. D. A.*); Some Factors Influencing Swine Erysipelas Prophylaxis, by L. Van Es, J. F. Olney, and I. C. Blore (pp. 34-42) (*Univ. Nebr.*); Listerellosis in Swine and Criteria for Diagnosis, by H. E. Biester and L. H. Schwarte (pp. 42-46) (*Iowa State Col.*); The Standardization and Control of *Brucella abortus* vaccine, by E. L. Love (pp. 84-87), A Survey of Field Results With Standardized *Brucella* Antigen, by H. I. Thaller (pp. 88-90), and Calftood Vaccination as an Aid in Cooperative Bang's Disease (Bovine Brucellosis) Control, by J. R. Mohler, A. E. Wight, and H. M. O'Rear (pp. 90-102) (all *U. S. D. A.*); The Demonstration of Tubercle Bacilli From Tissues of Cattle Tested With Avian and With Mammalian Tuberculosis, by W. H. Feldman and H. E. Moses (pp. 109-118); Phenothiazine and Anthelmintic Medication, With Special Reference to Parasitic Diseases of Sheep, by W. E. Swales (pp. 130-135); and Eradication of Pullorum Disease From Turkey Flocks, by W. R. Hinshaw and E. McNeil (pp. 178-194) (*Univ. Calif.*).

[Work in animal pathology and parasitology by the Arizona Station] (*Arizona Sta. Rpt. 1940*, pp. 50-51).—The work of the year (*E. S. R.*, 84, p. 101) briefly reported upon relates to death losses in calves on alfalfa pasture, infectious keratitis in cattle on range and feed lots, control of the common cattle grub, and range castration of sheep.

[Work in animal pathology and parasitology by the Florida Station] (*Florida Sta. Rpt.* 1940, pp. 61-62, 63-64, 69, 71).—The work of the year (E. S. R., 83, p. 677) reported upon includes studies of cobalt and copper deficiency in cattle, by W. M. Neal and L. L. Rusoff; the etiology of fowl paralysis, leukemia, and allied conditions in animals, by M. W. Emmel (E. S. R., 80, p. 400); plants poisonous to livestock in Florida, by D. A. Sanders and E. West; enzootic broncho-pneumonia (pneumoenteritis) of dairy calves, by Sanders (E. S. R., 83 p. 680); and rotational grazing and internal parasites in sheep production, by A. L. Shealy and A. W. Leland.

Contribution to the study of the poisonous plants of Brazil, E. M. MORAES MELLO and J. SAMPAIO FERNANDES (*Contribuição ao estudo das plantas tóxicas Brasileiras. Rio de Janeiro; Min. Agr., Dept. Nac. Prod. Anim., 1940, pp. [1]+50+1, [pls. 2, figs. 10]*).

A standardized technique for sedimentation rate, J. W. CUTLER (*Jour. Lab. and Clin. Med.*, 26 (1940), No. 3, pp. 542-552, figs. 7).

The inter-relationship between the allergic responses of guinea-pigs sensitised with various members of the acid-fast group of organisms, L. SAHAI (*Vet. Jour.*, 97 (1941), No. 4, pp. 113-122).

Rapid diagnostic method for testing the virulence of corynebacteria, V. B. DOLEPOLO and H. Y. MARKUS (*Jour. Lab. and Clin. Med.*, 26 (1940), No. 3, pp. 553-556).—A practical 4-day diagnostic test for the virulence of bacilli of the *Corynebacterium* group is suggested by the authors. The bacterial suspensions for guinea pig inoculation are prepared from colonies of the corynebacteria cultured from the nose and throat swabs on blood agar potassium tellurite plates. No false positive reactions are observed. False negative results are avoided by the use of five or more colonies for the preparation of the bacterial suspensions.

Brucellosis (Bang's disease and undulant fever): The story of research dealing with their interrelationships, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 207-210).—This review of brucellosis work is presented under the headings of diagnostic studies; the bovine, goat, and swine types; brucellosis in animals and undulant fever in man; Brucellergen and Brucellin; and costs and support—and returns.

Brucella, *Pasteurella tularensis*, and *Proteus* agglutinins in chronic brucellosis, R. M. CALDER (*Jour. Bact.*, 41 (1941), No. 5, pp. 593-604).—Studies of *Brucella*, *P. tularensis*, and *Proteus* agglutinins in a large series of cases suffering from chronic brucellosis are reported upon and a comparison is made with groups of healthy individuals.

The resistance and sensitivity of *Br. abortus*-infected guinea-pigs, A. D. McEWEEN (*Vet. Rec.*, 53 (1941), No. 13, pp. 183-185).—It was found that infected guinea pigs are highly resistant to reinfection with *Brucella abortus*; that the bacteria of reinfection are rapidly removed from the blood stream and do not become established in the spleen, liver, kidneys, placenta, or lymphatic glands except in the case of those lymphatic glands draining an area where a heavy localized infection has been produced. Infected guinea pigs are sensitized to *B. abortus* and die within 24 hr. of the intraperitoneal inoculation of numbers of organisms that cause no marked disturbance in normal animals.

Observations on the treatment of mastitis with acriflavine, S. D. JOHNSON (*Cornell Vet.*, 31 (1941), No. 2, pp. 127-148, figs. 4).—A description is given of the essential equipment with instructions for acriflavine chemotherapy. In the work reported a large percentage of treatments were made on drying-off or dry udders. Results of treating *Streptococcus agalactiae*-infected quarters with 1 : 4,000 acriflavine solution in four dairy herds are discussed. Of 237 treated

quarters, 164 were freed from infection by one treatment and 204 by one or more treatments. Fifty-four of the treated quarters were reinfected with *S. agalactiae*. Healthy untreated quarters are less susceptible to infection than treated quarters freed from infection. Advanced chronic mastitis cases usually do not respond favorably to treatment. Mastitis cows should be given a 3-mo. dry period. Combined with treatment, the results are highly successful. Cows freed from infection tolerate regular amounts of dairy grain and produce well. An estimated 75 percent of the treated cows will have a prolonged usefulness in the milking line of 1 or more years. Of 126 *S. agalactiae*-infected quarters in 53 cows, 108 samples drawn from these quarters were characterized by heavy, thick pus, or large clots and serum, while 18 samples appeared normal. Udders showing trouble with mastitis from infections other than *S. agalactiae* are receiving treatment. Limited data indicate favorable results. Recent experience points favorably to treatment of lactating quarters with a 1 : 8,000 acriflavine solution.

A modification of the method usually employed to obtain specific cultures from Salmonella group variants, G. T. L. ARCHER (*Jour. Roy. Army Med. Corps*, 76 (1941), No. 3, pp. 143-146).—The author confirms the work of P. R. Edwards and F. Kauffman which demonstrated the presence of specific antigens in *Bacterium thompson berlin* and *B. newport puerto-rico*. The value of the combined use of soft agar and serum broth as a means of obtaining specific phase cultures from apparently pure group phase organisms by preventing the development of the "O" variant otherwise so liable to occur is demonstrated.

Effect of sulfanilamide, sulfapyridine, and sulfathiazole on Staphylococcus toxins, M. BAYLISS (*Soc. Eapt. Biol. and Med., Proc.*, 44 (1940), No. 2, pp. 525-529).—The author found that toxic manifestations of staphylococci are not inactivated in vitro by sulfanilamide, sulfapyridine, or sulfathiazole. The lethal toxin, dermonecrotic toxin, coagulase, and enterotoxin are not neutralized by solutions of the sulfonamides tested at 37° C. α - and β -hemolysins are slightly diminished in activity at concentrations approaching the saturation point of the sulfonamides, but are unaffected at concentrations of less than 0.01 percent. These compounds appeared to decrease hemolysin production by decreasing the growth rate of the organism.

Staphylococcic bacteremia: Treatment with sulfapyridine and sulfathiazole, W. W. SPINK, A. E. HANSEN, and J. R. PAINE. (Univ. Minn.). (*Arch. Int. Med.*, 67 (1941), No. 1, pp. 25-35).—Sulfathiazole appears to be the best therapeutic agent for the treatment of staphylococcic bacteremia, the blood of all 15 cases thus treated having been successfully sterilized as compared with 6 of 10 cases treated with sulfapyridine.

The Rocky Mountain wood tick and tick borne diseases, W. B. DAVIDSON (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 5, pp. 123-133, 136-137, figs. 8).

Infection of chick embryos and chicks with Trypanosoma equiperdum by the intravenous route, J. E. CRAIG (*War Dept. [U. S.], Off. Surg. Gen., Vet. Bul.*, 35 (1941), No. 1, pp. 38-45).—In experimental work by the author *T. equiperdum* was grown successfully on developing chick embryos. Passages were made from egg to egg, and the organism was maintained in this manner for 18 passages. There was no reason to think that the growth would not be indefinite. Embryos can be infected by intravenous inoculation from the time their veins develop until they hatch out. Chick embryos are more susceptible to trypanosomes when they are injected into the vein than when they are injected into the chorioallantoic cavity. Chicks have been infected by injecting the trypanosomes into the embryo prior to hatching. Twenty-five per-

cent of the day-old chicks inoculated intravenously have shown blood stream infection.

Effect of parenteral administration of vitamin B₁ and vitamin B₂ on a coccidium infection, E. R. BECKER. (Iowa State Col.). (*Soc. Expt. Biol. and Med., Proc.*, 46 (1941), No. 3, pp. 494-495).—Brief report is made of work which has led to the conclusion that vitamins B₁ and B₂ have an inhibiting influence on the development of the coccidium *Eimeria nieschulzi* infections in rats on a special ration when administered by a parenteral route, one at least as striking as when the vitamins are fed.

Studies on phenothiazine.—II, Continued feeding of phenothiazine, C. W. EDDY, A. J. COX, and F. DEEDS. (U. S. D. A.). (*Jour. Indus. Hyg. and Toxicol.*, 19 (1937), No. 10, pp. 574-578, fig. 1).—In a further study of this anthelmintic and insecticide (see page 585), chronic feeding experiments on white rats were made in concentrations from 0.025 to 0.4 percent in the diet. "The first definite retardation of growth occurred with a diet containing 0.30 percent phenothiazine. At all levels of phenothiazine intake, the growth of individual organs remained normal relative to surface area of the body. All tissues examined failed to show demonstrable evidences of injury by phenothiazine. The small amounts of phenothiazine which may remain on apples as a spray residue lack demonstrable toxic or injurious effects, which are minor with the highest quantities, beyond those likely to be consumed by man, thus indicating phenothiazine is a comparatively safe insecticide from a public health standpoint."

Studies on phenothiazine, III, IV, F. DEEDS and C. W. EDDY (*Jour. Amer. Chem. Soc.*, 60 (1938), Nos. 6, pp. 1446-1447; 9, pp. 2079-2084, figs. 4).—These further studies (see above) report upon The Conversion of Phenothiazine to Thionol and Potentiometric Characterization of Thionol, respectively.

Sulfanilamide solution as a topical application for infected wounds, A. APPELEY. (Tex. A. & M. Col.). (*Vet. Med.*, 36 (1941), No. 6, pp. 300-304).—From a review of cases, presented with a list of references to the literature, it is considered evident that the new sulfanilamide solutions, including (1) 30 gr. of sulfanilamide per ounce of propylene glycol, (2) 60 gr. of sulfanilamide per ounce of solvent consisting of 72 percent propylene glycol and 28 percent triethylene glycol, and (3) U-S-B solution, containing 40 gr. of sulfanilamide, 40 gr. of urea, and a small amount of benzyl alcohol per ounce of propylene glycol, are valuable adjuncts in the treatment of infected wounds.

Calfhood vaccination against Bang's disease, R. R. BIRCH, H. L. GILMAN, and W. S. STONE (*Cornell Vet.*, 31 (1941), No. 2, pp. 170-182).—Report is made of the progress of work commenced in 1926 with calves negative to the agglutination test for Bang's disease that were purchased from herds in the vicinity of Ithaca, N. Y.

Problems relating to the immunisation of cattle against Br[u]cella abortus, A. D. McEWEEN (*Vet. Rec.*, 53 (1941), No. 17, pp. 237-239).

Phenothiazine as an anthelmintic for cattle under field conditions, L. E. SWANSON and B. E. CARLISLE. (U. S. D. A.). (*Vet. Med.*, 36 (1941), No. 6, pp. 312-315, figs. 3).—The results of tests conducted in cooperation with farmers in the vicinity of Camilla, Ga., are reported. Unconditioned phenothiazine as an anthelmintic was tested under farm conditions on 537 cattle of various ages and was found to be efficient and economical when used at a dose rate of 30, 40, 50, 60, 70, or 80 gm., depending on the size of the animal, this schedule applying to all animals from 3-month-old calves to adult cattle. The drug was found to be comparatively nontoxic. It is pointed out that the drug is easily administered in ½- and 1-oz. capsules and appears to be a practical as well as a highly efficacious treatment for cattle under farm and range conditions. Single treat-

ments have given results superior to frequently repeated dosings with other anthelmintics. The animals to be treated should be fasted from 18 to 24 hr. and allowed access to water. Following treatment, they may be turned out to pasture or fed immediately.

The significance of long-chained streptococci in Breed smears of market milk, J. FERGUSON (*Cornell Vet.*, 31 (1941), No. 2, pp. 183-192).—The results of the bacteriological examinations of 60 weigh-vat samples of market milk in which long-chained streptococci were detected by means of the Breed smear are reported. "Mastitis streptococci were found as the predominating organism in 39. In 26 of these samples the cell count exceeded 1,000,000 per cubic centimeter. Phagocytosis was observed in 10. In 21 of the 60 weigh-vat samples the streptococci present in largest numbers were of types not found in the bovine udder. From 16 of the samples streptococci resembling *Str[eptococcus] cremoris*, a long-chained streptococcus associated with dairy utensils, were isolated. The organisms from the remaining 4 samples were of diverse types. Phagocytosis was not observed in the Breed smears. In 4 of these 21 samples the cell count was greater than 1,000,000 per cubic centimeter. Descriptions are given of 292 individual quarter secretions obviously unfit for the milk supply. Only 50 of the 292 samples contained streptococci in numbers sufficient to be detected in the Breed smear of mixed milk. Of 36 secretions from mastitis quarters which contained such large numbers of streptococci only 6 were macroscopically normal."

The influence of varying copper intake on normal blood copper of Northumbrian sheep, A. EDEN (*Jour. Compar. Pathol. and Ther.*, 52 (1939), No. 3, pp. 249-257, fig. 1).—These data are presented in order to provide representative figures for blood copper values of sheep.

Further observations on the blood copper of Northumbrian sheep, A. EDEN (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 186-193, fig. 1).—In a further study of the blood copper content of sheep (see above), blood copper data are presented on 94 sheep divided into 4 experimental groups on a "border-pining" hillside in Northumberland in 1940, in comparison with more extensive findings reported in 1939. "The mean value for comparable sheep was 0.080 mg. percent in 1940 as compared with 0.086 mg. percent in 1939, the over-all range, 0.013-0.210 mg. percent, being even wider than before. Variations between animals comprising a group were as wide as between groups, and blood levels were not affected by moderate variations in Cu intake. Only in young sheep was there any evidence that a mineralized cake supplement containing Cu sufficient to double the natural grazing intake had any elevating effect on blood copper. Variations between values for the same individuals in 1939 and in 1940 were as wide as between different individuals in either year. Over 25 percent of the sheep showed Cu levels in 1940 falling within ± 0.01 mg. percent of their 1939 values, but nearly 20 percent showed figures differing by more than ± 0.05 mg. percent, irrespective of differences in group treatments. The significance of the figures for normal Northumbrian ewes is discussed in relation to those reported for Derbyshire ewes bearing lambs affected with 'enzootic ataxia' or 'swayback.'"

The toxin of *Corynebacterium ovis*, H. R. CARNE (*Jour. Pathol. and Bact.*, 51 (1940), No. 2, pp. 199-212, fig. 1).—Observations on the soluble toxin produced by all of 200 strains of *C. ovis* isolated from lesions of caseous lymphadenitis in Australian sheep are reported. Though variations in toxigenicity were observed, no strains were encountered which were completely nontoxigenic. The conditions necessary for the production of potent toxin are described. Details of a method of concentrating and drying toxin are given. The general properties of the toxin are described, including its stability, susceptibility to physical and

chemical agents, and pathogenic action. Specific antitoxin is produced in the tissues of naturally and experimentally infected animals and has been produced by inoculation of toxoid into horses. Methods for the establishment of standards for toxin and antitoxin are described, and measurements of toxin and antitoxin in terms of these standards have been made. The level of antitoxin in the serums of 90 infected adult sheep was determined. The possibility of developing a diagnostic test in sheep comparable with the Schick test in man was investigated. The test failed to show a degree of efficiency which would render it of value for the accurate detection of infected animals.

Parasitic gastritis in sheep: Comparative trials on lambs with phenothiazine and copper-nicotine mixture. W. L. STEWART and H. D. CROFTON (*Vet. Rec.*, 53 (1941), No. 12, pp. 167-170).—Under the conditions of the two experiments reported, phenothiazine proved an efficient anthelmintic for lambs, and its value was more apparent when administered to patent cases of parasitic gastritis. It proved more effective than dosing with either copper-nicotine mixture or with a combination of copper nicotine and phenothiazine. Its effect proved to be greatest on what are considered the pathogenic species, i. e., *Ostertagia* and *Trichostrongylus axei*, and it was less effective than copper-nicotine solution in removing *Moniezia capansa* and *Nematodirus filicollis*. It removed most of the worms in the abomasum of treated lambs. The experiments indicate that phenothiazine is a valuable anthelmintic for sheep, and its wide use is recommended.

Field trials with phenothiazine on lambs. G. F. BODDIE, H. H. CORNER, D. O. MORGAN, and J. E. N. SLOAN (*Vet. Rec.*, 53 (1941), No. 12, pp. 170-173).—Based on the egg counts, weights, and post-mortem examinations made, phenothiazine was found to be a more effective anthelmintic for sheep than the copper-nicotine mixture. Although the copper-nicotine mixture is less effective than phenothiazine, it is shown to be of some value when compared with the group receiving no treatment.

Helminth parasites in sheep. W. L. THELKELD (*Virginia Sta. Tech. Bul.* 68 (1941), pp. 46, figs. 10).—An investigation of the prevalence and control of helminth parasites (of sheep) was commenced in 1932, at which time an examination was made of sheep from farms in a radius of 25 miles of Blacksburg. The prevalent nematodes present in the alimentary tracts of these sheep were *Oesophagostomum columbianum*, *Haemonchus contortus*, *Nematodirus* sp., and *Ostertugia circumcincta*. The latter species occurred in over 50 percent of the animals examined. *Trichostrongylus* spp. were observed but were not considered important. Where *O. circumcincta* was present to large degree, the infestation was almost pure. The preponderance of this strongylid in contrast to the scarcity of *H. contortus*, combined with reports frequently mentioned in the current literature, suggested the hypothesis that treatments efficacious against *Haemonchus* sp. failed to expel *Ostertagia* sp.

A study was then made of the viability of the infective larvae of *O. circumcincta* under field conditions. These larvae withstand temperatures as low as -10° F. and may remain infective in paddocks for a period of 11 mo. High egg counts in lambs infested with this species generally were found to occur after increased precipitation. The number of adult *O. circumcincta* established in 2 lambs grazing during a dry season of 2 weeks' duration preceded by slight precipitation was increased over the number of adults found in 2 lambs grazing for a period of 2 weeks' drought preceded by 2 days totaling 2 in. of precipitation.

Copper sulfate in strengths of from 1 to 4 percent administered to lambs in compatible doses was shown to be inefficient against *O. circumcincta*, while

tetrachloroethylene administered as described was efficient. The employment of from 2.5 to 3 cc. of a 10 percent copper sulfate solution for stimulating closure of the oesophageal groove in 62 animals was 70.96 percent effective in directing capsules not larger than 16 mm. in diameter by 20 mm. in length to the abomasum and has approximately a 2.5:1 ratio advantage over the method employed without preliminary treatment with copper sulfate. A tabular comparison is made of the efficiency of various chemicals employed in field treatments of 66 sheep. Results of field treatments with phenothiazine in doses ranging from 0.16 to 0.6 gm. per pound of body weight of animal are described. These animals, slaughtered at intervals of from 15 days to 3 mo. and 18 days after such treatments, gave an extremely small degree of parasitic infestation. The most persistent species after treatment with phenothiazine are *Trichostrongylus* spp. in the small intestine and *Bunostomum trigonocephalum*. The efficiency of various chemicals, including thionol and phenothiazone, administered to sheep maintained under controlled conditions are recorded, further experimental work with phenothiazone being indicated.

The seasonal fluctuation of helminth parasites in sheep in southwest Virginia is ascertained, and recommendations for seasonal treatments with phenothiazine are made. In general, two treatments at the rate of 0.6 gm. per pound of body weight are recommended in the late summer, one treatment in November and one in January or March, depending upon the prevailing local customs of breeding.

The details of the investigation are given in 10 tables, and a bibliography of 61 titles is included.

Studies upon the relation of nutrition to the development of necrotic enteritis in swine.—II, Nicotinic acid, yeast, and liver in the prevention of necrotic enteritis in young pigs fed massive doses of *S. choleraesuis*, G. K. DAVIS and V. A. FREEMAN. (Mich. Expt. Sta.). (*Amer. Soc. Anim. Prod. Proc.*, 33 (1940), pp. 316-323; *abs. in Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 294-295).—In continuation of the work noted (E. S. R., 83, p. 97) experiments were conducted with pigs in which massive single doses of a culture of *Salmonella choleraesuis* were given as a drench to test the effectiveness of liver, yeast, and nicotinic acid in preventing the development of necrotic enteritis. All pigs given the culture reacted with a rise in temperature, but marked differences were noted in the development of necrotic enteritis. Best protection came with the feeding of liver. Nicotinic acid gave some protection to the pigs fed a supplement of this material. Dried bakers' yeast at the rate of 50 gm. per pig per day gave no protection. It is postulated that the protective action of these supplements is by maintaining the nutrition of the pig rather than a specific action against the *S. choleraesuis* organism.

Chemotherapeutic studies of infectious anemia of horses, C. D. STEIN, O. L. OSTEN, and L. O. MOIT. (U. S. D. A.) (*Vet. Med.*, 36 (1941), No. 6, pp. 306-310).—In an attempt to determine their therapeutic value in infectious anemia, a series of experiments was conducted with sulfanilamide, sodium sulfanilyl sulfanilate, merthiolate, crystal violet, sodium cacodylate, hydrochloric acid, formin, fuadin, and potassium permanganate. Administered either intravenously or orally, a temporary improvement in the general condition and a slight increase in the red cell count were produced by sodium cacodylate in one out of three cases treated and by hydrochloric acid in one out of two cases. None of the other drugs tested had any favorable influence on the course of the acute or chronic form of the disease. Neither did any of the agents used free infected animals from the virus.

Phenothiazine in emaciated horses, M. G. FINCHER and W. J. GIBBONS (*Cornell Vet.*, 31 (1941), No. 2, pp. 220-223).—Observations are reported which, while in no way condemning phenothiazine as a useful agent in handling the parasite problem in horses, suggest that horses showing extreme anemia, emaciation, and possibly chronic swamp fever are not good subjects upon which to use this anthelmintic.

Neutralization tests with equine encephalomyelitis virus, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 5, pp. 138-144).—In neutralization tests on 16 horses, 1 of which was a recovered case, the serum of 4 gave partial protection to guinea pigs and of 4 others complete protection. "Serum of the recovered case afforded only partial protection on the first test but complete on the second trial. One serum proved lethal to guinea pigs on both tests. The remaining 6 afforded no protection. On a repeat test, the same 6 negative serums again afforded no protection. There were changes as between partial and complete protection in some of the others, but this test confirmed the presence of neutralizing antibodies in 8 of the 16 horses that had not shown any evidence of clinical infection. The serums of 6 of 9 horses collected 10 mo. after vaccination afforded complete protection to the injected guinea pigs, but 2 of these had been protective prior to vaccination. Two of the other samples protected one of the two guinea pigs and 1 sample did not protect either.

"In another group of horses, from which samples were taken 12 mo. after vaccination, 17 of 20 serums protected both guinea pigs, and 3 samples protected one of each pair. Serum of a recovered mare was fully protective for guinea pigs some 20 mo. after the attack. This mare had a foal which was a few weeks old at time of test, and the serum of this animal also protected guinea pigs. Prevacination samples from six members of the staff showed no neutralizing power. One mo. after vaccination two were again tested, and both showed solid protection for guinea pigs. Seven mo. after vaccination, five of the six were tested. One afforded complete protection, two protected one guinea pig only, and two did not protect either. Eleven samples from suspected cases in humans were examined. Three were contaminated. Five of the remaining 8 showed some protective power. Two samples protected both guinea pigs, 3 protected one of each pair, and 3 afforded no protection.

"A few samples of fresh human and equine serum were lethal for guinea pigs when injected by the intracerebral route. Holding the serum for 24 to 48 hr. removed this quality. Neutralizing antibodies in a positive human serum were destroyed by heating at 60° C. for 30 min. Neutralized virus did not afford protection to guinea pigs against a subsequent challenge inoculation."

Equine encephalomyelitis in man, A. ADLER (*Amer. Jour. Pathol.*, 17 (1941), No. 3, pp. 407-410, pls. 2).—This is a report of a case with a clinical, serologic, and pathologic picture which could not be differentiated from that of equine encephalomyelitis in man.

Is fright disease an avitaminosis, G. BERRYMAN and C. F. SCHLOTTHAUER (*North Amer. Vet.*, 22 (1941), No. 1, pp. 34-38, fig. 1).—In the experiments reported, anorexia developed after 30 days in dogs receiving a diet that was deficient in protein and low in thiamin, but they did not manifest symptoms of so-called fright disease after prolonged feeding of this diet. Dogs receiving a diet completely devoid of thiamin have shown no symptoms of so-called fright disease after several months. The classical symptoms of thiamin deficiency (anorexia, loss of weight, muscular weakness, and ataxia) have been produced only after a protracted length of time, and the symptoms were dispelled by intramuscular administration of thiamin.

A deficiency disease of foxes produced by feeding fish—B₁ avitaminosis analogous to Wernicke's disease of man. R. G. GREEN, W. E. CARLSON, and C. A. EVANS. (Univ. Minn. et al.). (*Jour. Nutr.*, 21 (1941), No. 3, pp. 243-256).—This is a further account of a disease, a brief description of which and its relation to Wernicke's hemorrhagic polioencephalitis of man has been noted (E. S. R., 84, p. 93). This affection, referred to as Chastek paralysis, it having first been observed in 1932 on a ranch in Minnesota owned by J. S. Chastek, is an economically important acute disease of foxes occurring in violent outbreaks on ranches where uncooked fish is included as 10 percent or more of the ration. It causes a high mortality among nursing pups and intrauterine death of fetuses. The disease may easily be produced experimentally with a diet containing fresh carp and can be prevented by adding large amounts of thiamin to the same ration. Characteristic neurologic symptoms occur, and diagnostic lesions identical with those of Wernicke's hemorrhagic polioencephalitis of man are found in the brain. Pathologic findings, limited therapeutic field trials of thiamin, and histories of ranch outbreaks confirm the experimental evidence that Chastek paralysis is fundamentally a B₁ avitaminosis. How fish can induce a deficiency of vitamin B₁ is unknown, but it is suggested there may be a chemical splitting of thiamin by some constituent of fish.

Amyloidosis in mink [trans. title], I. NORDLUND (*Skand. Vet. Tidskr.*, 31 (1941), No. 1, pp. 1-8, figs. 2; *Eng. abs.*, pp. 7-8).—Amyloid deposits in minks, which have occurred mostly in the liver and spleen but were also observed in the mucous coat of the stomach and the intestine, in the lungs, and adrenal bodies and, in one instance, in the kidneys, were found to be restricted locally to certain farms.

Sulphur therapy in experimental avian coccidial infection with *Eimeria necatrix*. P. P. LEVINE (*Cornell Vet.*, 31 (1941), No. 2, pp. 120-126).—In the series of five experiments reported flowers of sulfur incorporated in the mash in the proportion of 5 percent was found to exert the same beneficial effect in avian coccidial infections with *E. necatrix* as has been reported in infections with *E. tenella*. When sulfur was fed regularly, beginning before the time of infection with *E. necatrix*, mortality was prevented and the lesions in the intestines were slight. The controls suffered heavy mortality with severe intestinal lesions. Flowers of sulfur had no value when fed to chickens already infected with *E. necatrix*. This was true whether or not the birds showed symptoms of infection at the time of beginning treatment. Birds that were exposed to infection and protected during a sulfur-feeding period of 5 weeks succumbed to lethal exposures after the withdrawal of the sulfur. The protective effect of sulfur was demonstrated when the sulfur was withdrawn from the ration 10 hr. after a chicken had been dosed with oocysts of *E. necatrix*. The use of sulfur in the proportion of 5 percent of the ration for a week is recommended at the onset of an outbreak of coccidiosis due to *E. necatrix*. This treatment is advised as a temporary expedient to protect the birds while more permanent measures of sanitation are effected.

The coccidiostatic effect of sulfaguanidine (sulfanilyl guanidine). P. P. LEVINE (*Cornell Vet.*, 31 (1941), No. 2, pp. 107-112).—In preliminary experiments on the coccidiostatic effect of the recently developed compound sulfaguanidine on coccidia of fowls it was found that concentrations as low as 0.5 percent of the ration prevented infection of chickens with *Eimeria praecox*, *E. mitis*, *E. maxima*, and *E. hagani*. Concentrations of 1 percent in the feed were effective in reducing, markedly, the severity of cecal lesions due to *E. tenella*. A concentration of 1.5 percent was effective against *E. necatrix*. The feeding of sulfaguanidine had no curative effect on chickens already infected with *E. tenella* and *E. necatrix*.

It is considered to hold promise as a possible coccidiostatic agent for the control of all types of coccidiosis. Until experiments are conducted to determine the effect of feeding sulfaguanidine over long periods of time, decision as to the possible usefulness of this drug in the field must be reserved.

Cholesterol content of brain in nutritional encephalomalacia of vitamin E-deficient chicks, F. B. ADAMSTONE (*Arch. Pathol.*, 31 (1941), No. 6, pp. 711-716, fig. 1).—Determinations of the total cholesterol content of the brain were made of normal chicks and vitamin E-deficient chicks in which nutritional encephalomalacia had developed. The brains were extracted with chloroform, and cholesterol was determined colorimetrically with a photometer, the Liebermann-Burchard reaction being used. The results have shown that the normal brain contains a higher proportion of cholesterol in milligrams per 100 gm. of dry brain substance than the brains of chicks suffering from nutritional encephalomalacia. The decrease in cholesterol content of the brains of diseased chicks occurs during the third week, progressing rapidly thereafter, and it is suggested that this time marks a critical period for the maintenance of normal cholesterol metabolism in the brain of the chick. Furthermore, since a cholesterol disturbance also occurs in dystrophic rabbits and in women subject to habitual abortion, there appears to be a very definite relation between vitamin E and normal cholesterol metabolism. It has also been demonstrated that in the brains of chicks deficient in vitamin E there is little or no increase in cholesterol content after the second week, whereas there is a marked increase in the normal brain. This fact gives further support to the possibility of a relationship between vitamin E and cholesterol metabolism.

Fowl paralysis, B. A. BEACH. (Univ. Wis.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 6, pp. 368, 384).—A popular account.

A probable agent for the transmission of fowl paralysis, J. C. BROWN and J. C. CROSS (*Science*, 93 (1941), No. 2422, p. 528).—Report is made of preliminary experiments in Texas which indicate that the fowl tick may be an agent for the transmission of fowl paralysis.

Further bone phosphatase studies in chick perosis, A. C. WIESE, G. H. BENHAM, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta. et al.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 255-258).—In a further study of bone phosphatase in chick perosis (*E. S. R.*, 81, p. 694), the maximum phosphatase activity was found to be located at the extreme end of the bone. The bone phosphatase activity of chicks receiving adequate manganese is much higher than that of perotic birds. The upper end of a given bone has a much higher phosphatase activity than the lower end. The increase in phosphatase activity is not due to a mere activation of the enzyme by the manganese ion, but rather to an actual increase in the amount of enzyme present.

Studies of perosis in turkeys.—I, Experiments related to choline, T. H. JUKES. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 3, pp. 251-254, fig. 1).—In further work¹⁰ (*E. S. R.*, 84, p. 803), the results obtained illustrate the ability of choline to promote growth and prevent perosis in turkeys on a diet containing an adequate level of manganese. A preparation of lecithin from egg yolk had an effect similar to that of choline. Methionine, inositol, and creatine were ineffective. Various feedstuffs were tested for their ability to prevent perosis under conditions similar to those in which choline is effective. Soybean meal was a good source of the antiperotic factor; sardine meal was good; cottonseed meal and barley were fair. The results with these and other feedstuffs are tabulated.

¹⁰ *Poultry Sci.*, 18 (1939), No. 5, pp. 405-406.

Soybean meal, sardine meal, cottonseed meal, corn, wheat, and barley all supplied growth-promoting essentials for turkeys which were not identified.

Perosis due to a vitamin deficiency, A. G. HOGAN, L. R. RICHARDSON, H. PATRICK, and H. L. KEMPSTER. (Mo. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 327-340, figs. 9).—In the course of the experimental work reported a procedure was devised by which perosis can be produced uniformly in the chick even when manganese is supplied in abundance. This type of perosis results from the absence of a specific organic nutrient. Choline is such a nutrient, but it was not shown to be the only one. Under the procedure followed the supply of calcium, phosphorus, manganese, iron, aluminum, or zinc was not responsible for either the incidence or degree of perosis. It is pointed out that the long bones of perotic chicks are abnormally short and thick. A list is given of 13 references to the literature cited.

Critical tests with tetra-alkyl tin compounds for the removal of *Railletina cesticillus* from experimentally infected chickens, J. E. GUTHRIE, W. C. POWICK, and D. BANDEL. (U. S. D. A.). (*North Amer. Vet.*, 22 (1941), No. 1, pp. 22-24).—In the limited tests here reported, tetraisobutyl tin plus synthetic pelletierine hydrochloride was effective for the removal of the tapeworm *R. cesticillus* from chickens, although tetraisobutyl tin when used alone was ineffective. Thus when employed in the proper combinations, organic stannic compounds, as well as organic stannous compounds, may prove effective as poultry teniacides. It is pointed out that tetraphenyl tin and triphenyl tin chloride were the only stannic compounds previously tested as teniacides in poultry, the former having proved to be ineffective and the latter extremely toxic.

Paratyphoid enzooty caused by *Salmonella typhi* murium in poultry with transmission to man [trans. title], H. HEDSTRÖM (*Skand. Vet. Tidskr.*, 31 (1941), No. 2, pp. 98-118, figs. 2; *Eng. abs.*, pp. 114-116).—The owner of a flock of adult and young fowl, including geese, turkeys, and chickens, in which a paratyphoid infection caused by *S. typhimurium* appeared and was responsible for a high mortality among the young birds, became ill about 2 weeks after the first appearance of the disease among the fowl, as did three other adult members of the family. All four gave seropositive reactions to this organism, which was also isolated from the feces of three of the members. By killing the infected animals, serodiagnostic control, and disinfection, the disease was kept within bounds and finally exterminated from the flock. A list is given of 33 references to the literature.

Detection of potential botulinus-toxin-producing areas in western duck marshes, with suggestions for control, E. R. QUORTEUP and A. L. HOLZ (*Jour. Bact.*, 41 (1941), No. 3, pp. 363-372).—In an attempt to elucidate some of the highly complex factors involved in the production of *Clostridium botulinum* type C toxin, made at the Bear River Wildlife Disease Research Station in Utah during the years 1937, 1938, and 1939, it was shown that the common aquatic and emergent vegetation as existing in western duck sickness areas may serve as an excellent medium for growth and toxin production of this organism. The chenopodid plant *Salicornia rubra* acts as a medium for this organism in the growing stage only, and since the dry plant did not produce toxin, it is thought possible that the same may hold true for other plants. Potential toxin-producing areas were demonstrated by use of the oxygen and the pH tests. Botulinus toxin was proved to be present in such oxygen-deficient areas. More experimental work, however, is required to determine the value of this test. Baking and aerating predetermined areas proved successful as control measures, as evidenced by a material reduction of sickness. Destructive action of aerobic bacteria on preformed botulinus toxin was demonstrated.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arizona Station] (*Arizona Sta. Rpt. 1940, pp. 26-37, fig. 1*).—This report notes ground-water studies in the Cortaro-Marana district, the Elloy district, the upper Santa Cruz Valley, and the Little Chino Valley; notes on forecasting the water supply and pumping equipment; and monthly measurements of evaporation for 1917-39 at Mesa, Yuma Valley, and Willcox.

Water control investigations [at the Florida Station]. (Coop. U. S. D. A.). (*Florida Sta. Rpt. 1940, pp. 173-174*).—Notes are given on work by D. S. Clayton and J. R. Neller on pumping and rainfall records, evaporation studies, subsidence data, and the effect of the water-table depth on yields of sugarcane.

A flow method for the determination of the effects of soluble chemicals on concrete, D. G. MILLER, C. F. ROGERS, and P. W. MANSON. (Minn. Expt. Sta. coop. U. S. D. A. et al.). (*Amer. Soc. Testing Mater. Proc., 39 (1939), pp. 900-912, figs. 10; abs. in Minnesota Sta. Rpt. 1940, pp. 46-47*).—Weak solutions of acetic acid and lactic acid were allowed to flow at the rate of 2 l. in 24 hr. over channels 1.5 in. wide on flat slabs of concrete and mortar set up at an angle of 17° from the vertical. The channels were formed either by paraffin dikes, permitting the acids to flow over an area 1.5 by 14 in., or by casting bars with shallow channels 1.5 by 14 in. Each channel was brushed with a flat steel brush, and the loosened material was filtered off, dried, and weighed.

Concrete with a modulus of rupture from 800 lb./sq. in. upward displayed resistance to corrosion of weak acids 3 times that of concrete with a modulus of rupture of 500 lb./sq. in. under the conditions of exposure used in these tests. Mortar made of the least resistant of 9 standard portland cements yielded a quantity of loosened material 1.6 times that released by mortar made of the most resistant of these 9 cements. Within the range of characteristics of the specimens used in the tests, the acid consumption was surprisingly uniform. Similar work with acid solutions simulating the acidity of silage juices has been reported by the same authors (*El. S. R., 82, p. 395*).

Tests of 106 commercial cements for sulfate resistance, D. G. MILLER and P. W. MANSON. (Minn. Expt. Sta. coop. U. S. D. A. et al.). (*Amer. Soc. Testing Mater. Proc., 40 (1940), pp. 988-1001, figs. 2; abs. in Minnesota Sta. Rpt. 1940, pp. 48-49*).—Concrete cylinders 2 by 4 in. were immersed for 5 yr. in 1 percent solutions of magnesium and sodium sulfates, and in the water of Medicine Lake, S. Dak., this lake having had a 12 percent average total salts content, mainly magnesium and sodium sulfates, during the test period. Changes in the length of the cylinders, taken as an index of volume changes, were determined. An increase of 0.01 in. was assumed to be equivalent to complete failure of the cylinder. The lake-water cylinders were tested for strength as compared with the strength of the cylinders held in tap water in the laboratory.

It was found in part that, on the basis of tests of 106 commercial cements, specifying an upper limit of 5.5 percent for the calculated compound $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ would have come as near to securing cements of high resistance to attack by magnesium and sodium sulfate as reasonably could be expected of a specification, and at the same time this limit would have eliminated all cements of low resistance.

Sulphate resistance of 94 commercial cements, P. W. MANSON. (Minn. Expt. Sta. coop. U. S. D. A. et al.). (*Agr. Engin., 21 (1940), No. 4, pp. 135-137, fig. 1; abs. in Minnesota Sta. Rpt. 1940, p. 49*).—Tests similar to those reported in the paper above noted showed that the most consistent index of the resistance of

a cement to sulfate attack is its calculated percentage of tricalcium aluminate ($3\text{CaO}\cdot\text{Al}_2\text{O}_3$). The cements that did not exceed 5.5 percent of this compound were, generally speaking, the most resistant of those tested. By limiting the percentage of the tricalcium aluminate to 5.5, the low sulfate-resistant cements are eliminated and nearly all of the more resistant are included.

Durable concrete silo staves, P. W. MINSON. (Min. Expt. Sta. coop. U. S. D. A. et al.). (*Agr. Engin.*, 21 (1940), No. 6, pp. 229-230, 234, figs. 2; abs. in *Minnesota Sta. Rpt.* 1940, pp. 49-50).—A laboratory apparatus by means of which it is possible to measure the relative resistance of different types of concrete staves to the action of weak acids has been devised. This test supports the importance of having concrete of high transverse strength and low absorption. This article deals only with silos made of dry-tamped concrete staves. Other work on dry-tamped concrete silo staves has been noted (E. S. R., 81, p. 583).

A teat cup solution rack, W. H. SHELDON and J. M. JENSEN (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 286-288, figs. 2).—This device, of which a fully dimensioned working drawing and photograph are reproduced with the article, holds the cups and tubing so that they may remain filled with the 0.4 percent lye solution recommended for cleaning and disinfecting. The rack includes also a shelf for a supply bottle of the lye solution. It is of wood and is easily and cheaply made.

An intermittent discharge valve for the septic tank, H. H. MUSSELMAN (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 272-275, fig. 1).—The author describes a valve designed to be made at small cost from corrosion-resistant material and to be added to the standard equipment with very little change in the design of the tank. The valve is of a double-float type. Its construction is shown, with bill of materials, in a drawing reproduced with the paper.

AGRICULTURAL ECONOMICS

The economics of agriculture, R. L. COHEN (*London: Nisbet and Co.*, [1940], pp. XIV+202, fig. 1).—The subject is dealt with in chapters on the complexity of agricultural production, diminishing returns and the location of agriculture, the size of farms, marketing, the reaction of supply and demand to price, the trend of agricultural earnings, the instability of agriculture, and State intervention in agriculture. It is considered largely from a peacetime basis.

[Notes on agricultural economics] (*Jour. Farm Econ.*, 22 (1940), No. 4, pp. 762-779, figs. 2).—Included are notes, as follows: The Student With an Urban Background and Agricultural Economics, by H. Schwartz (pp. 762-765); A Check on a Multiple Correlation Result, by M. Ezekiel (pp. 766-768), and Comparison of Results of Two Methods of Analysis, by E. Jensen (pp. 769-772) (both U. S. D. A.); Role of Soil Depletion in Land Valuation, by J. J. Livers and G. H. Craig (pp. 773-776) (Mont. State Col.); and Relative Importance of Changes in Demand and Quantity on Producer Revenues, by H. W. Halvorson and W. C. Waite (pp. 776-779) (Univ. Minn.).

[Investigations in agricultural economics by the Arizona Station] (*Arizona Sta. Rpt.* 1940, pp. 21-23, 25-26).—Brief findings are included as to the increase in custom work and changes in cultural practices in the Salt River Valley; cost of family living of 71 U. S. D. A. Farm Security Administration clients in 1939; the acreage, production, cost of production, and returns "on the tree" for grapefruit in 1940; the changes in acreages of different crops to meet the national agricultural adjustment program; and cost of pumping irrigation water in Pinal County and the factors affecting the cost.

[Investigations in agricultural economics by the Florida Station, 1939-40]. (Partly coop. U. S. D. A. et al.). (*Florida Sta. Rpt. 1940*, pp. 33-37).—A table by Savage and Noble shows the average costs, returns, production, profits, amounts of fertilizers used, etc., on midseason orange groves from 15 to 17 yr. old. A table by Spurlock and Noble shows the annual index numbers, 1909-10 to 1939, of Florida farm prices of grains, cotton and cottonseed, dairy products, poultry, citrus fruit, truck crops, meat animals, and miscellaneous crops, and the combined indexes for all the commodities.

Current Farm Economics, [February-June 1941] (*Oklahoma Sta., Cur. Farm Econ.*, 14 (1941), Nos. 1, pp. 32, figs. 3; 2, pp. 33-64, figs. 5; 3, pp. 65-96, fig. 1).—The usual discussion of the agricultural situation and the tables of prices and price and purchasing power indexes are included in each number in addition to the following articles:

No. 1.—Prospects for Crop Damage by Chinch Bugs and Grasshoppers in Oklahoma During 1941 (pp. 7-8) (coop. U. S. D. A.); Geographical Regions in Agriculture in Relation to Land Use Planning, by P. Nelson (pp. 8-17), a paper read at a conference of agricultural workers, December 6, 1940, at Texarkana; Agriculture and Other Surface Land Uses as Influenced by Mineral Developments, by J. Salisbury, Jr., and L. A. Parcher (pp. 18-24), a discussion of the problems in Oklahoma; and Membership of Cooperative Elevators, by A. L. Larson (pp. 24-28), based on data regarding 89 cooperative elevator associations in 1937. The average number of members was 143, of which 116 were patrons. The total number of patrons averaged 292. Grain producers constituted 91 percent of the voting members and owned 91 percent of the stock.

No. 2.—Limitations of the Beef Cattle Cycle as a Tool in Situation Analysis, by G. P. Collins (pp. 41-46). Charts show the relationships between (1) prices of beef cattle and number of beef cattle in the United States, (2) number of cattle on farms and beef and veal production, and (3) factory payrolls and prices received by farmers for beef cattle. "The thing that frequently causes loss to the cattleman is his response only to current prices without reference to the directional movements of market supplies and the conditions of demand." Some Effects of the Government Loan Program on the Cotton Situation, by H. A. Akers (pp. 46-53). The general characteristics of the Government loan policy are described and their effects analyzed. The findings are briefly summarized as follows: "(1) Areas distant from the mill districts have enjoyed a relatively higher loan rate, (2) the movement of high-quality cotton into trade channels has been retarded, (3) there is a relatively small amount of free cotton in interior cotton-producing areas, (4) production of higher quality cotton has been stimulated through the high premiums offered for high-quality cotton under the loan program, [and] (5) the market value of the farmer's equity in cotton loans varies inversely with the quality of cotton." Wheat Loans in Oklahoma and United States, by H. O. Shaw (pp. 54-57).

No. 3.—Quality and Size of the Oklahoma Cotton Crop, 1940-41, by K. C. Davis (pp. 71-75); Financing of Oklahoma Cooperatives, by A. L. Larson (pp. 76-85), discussing the extent of use of borrowed funds, size of loans, interest rates, etc., with tables showing, for 1936, the number of associations borrowing by type and principal sources of credit; number of loans according to type of association, purpose of loan, and term; the maximum amounts of short-, medium-, and long-term borrowings outstanding; and the average interest rates paid by source and term of loan. Surface Ownership and Assessed Valuation of Land in Mineral Areas of Oklahoma, L. A. Parcher and J. Salisbury, Jr. (pp. 86-93), including and discussing tables showing for lands in or near oil fields for new, settled, old, and for all areas, the size of tracts, ownership of lands held by individuals and corporations, and the lands exempt from taxation.

Publications dealing with farm management, 1903-June 30, 1940, M. A. CROSBY, M. R. COOPER, and D. E. MERRICK (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, pp. [2]-[33]*).—Included are bulletins, processed reports, and articles carried in official publications, prepared by Federal farm management workers alone or in cooperation with State and other agencies.

Factors influencing Alabama agriculture: Its characteristics and farming areas, B. F. ALVORD, M. A. CROSBY, and E. G. SCHIFFMAN. (*Coop. U. S. D. A. (Alabama Sta. Bul. 250 (1941), pp. 76, figs. 33)*).—Maps, charts, and tables are included and discussed showing the topography; types of soils; temperatures; precipitation; trends in population, tenure, number and size of farms, and improved land in farms; mobility of tenants and owner-farm operators; land values; taxation and mortgages; value of crops; land utilization; trends in crop acreages and yields; distribution; trends and distribution of livestock; etc. The nine farming areas of the State are described, with tables showing the acreages of different crops harvested in 1934 and the numbers of livestock and animal units per 100 acres of crops harvested January 1, 1935.

Economic and physical factors affecting new-ground farmers in Madison Parish, Louisiana, T. MULLINS and B. M. GILE (*Louisiana Sta. Mimeog. Otr. 12 (1940), pp. [7]-[27]*).—The extent and recent settlement of the cut-over lands, prices for such lands, terms and types of contracts for purchase, financial condition of purchasers, rate of clearing, physical and economic problems, cash income of settlers, etc., are described. The data were obtained from A. A. A. and parish records, officials of land companies, the county extension agent, and others.

An economic study of agriculture in the Little Beaverdam Creek area, Anderson County, South Carolina, M. J. PETERSON. (*Coop. U. S. D. A. (South Carolina Sta. Bul. 332 (1941), pp. 54, figs. 3)*).—A farm management analysis of the business of 107 farms and comparisons of the farms under and not under agreement with the Soil Conservation Service are made using data obtained in surveys in 1935 and 1939. The agriculture in the county and area, the use of production credit, farm mortgage indebtedness and farm receipts and expenses in the area in 1939, the factors affecting labor income, status of operators, landlord's return on capital, and the opportunities for improving the farm business are discussed.

The most important changes from 1935 to 1939 were an increase of 100 lb. per acre in the average lint cotton yield, a slight increase in the labor efficiency, and an increase in the average labor income per farm of \$100, of which approximately 75 percent resulted from higher Government payments. Labor income increased with the number of productive man-work units per farm, increases in crop index, cotton yields, and percentage of work units used on cotton. The five farms with the highest average labor income in 1939 (\$2,786) as compared with the five with the lowest labor income (—\$522) included 268 and 137 acres, respectively, with 162 and 71 acres, respectively, in crops. The farm receipts were \$7,644 and \$1,552, respectively. The capital invested was nearly the same in both groups. The production indexes were 115 and 99 and the number of work units 216 and 174, respectively. The landlord's return on capital invested (37 farms) was 3.8 percent on those operated by part owners, 7.4 for those operated by share renters, and 3.5 percent for those operated by cash renters. The productive work units per farm and per man, the crop index, and labor income were 560, 178, 97, and \$502, respectively, for the farms under agreements with the Soil Conservation Service, and 446, 183, 100, and \$369, respectively, for those not under such agreements.

Foreign Agriculture, [February-June 1941] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 5 (1941), Nos. 2, pp. 31-80, figs. 8; 3, pp. 81-125,*

figs. 10; 4, pp. 127-171, figs. 9; 5, pp. 173-214, fig. 1; 6, pp. 215-260, figs. 6).—Included are articles, as follows: No. 2, World Cacao Production and Trade, by B. C. Meridian (pp. 33-60), discussing the production, world trade, price trends, and status of production and trade in the principal exporting regions and importing countries, and Trade Agreements and Agricultural Foreign Trade, by E. M. Goodwin (pp. 61-80), briefly discussing the effects, direct and indirect, of reciprocal trade agreements of the United States. It was found that such agreements have increased the exports of the United States at least 100 million dollars. No. 3, Agriculture's Role in Hemisphere Defense, by J. L. Apodaca (pp. 83-102), deals with the hemisphere's deficiency and surplus of different agricultural products and cooperative measures for solving the problems, and Agriculture in British Malaya, by W. I. Ladejnsky (pp. 103-125), describes the physical background of the agriculture, population, land utilization, agricultural production, and foreign trade of the Malay Peninsula. No. 4, Agricultural and Food Control in Switzerland, by H. L. Franklin (pp. 129-158), discusses the wartime organization for agricultural and food control and the operations of such control, the agricultural requirements and supplies, and the wartime experience during 1914-18 and the present situation as to the blockade; Agricultural Policies of British Malaya, by W. I. Ladejnsky (pp. 159-164), deals with the British policy as to land administration, tenure, labor, agricultural science, and cooperative organizations; and The Inter-American Coffee Agreement, by J. B. Gibbs (pp. 165-171), describes the terms of the agreement signed at Washington by the United States and 14 other American republics on November 28, 1940, and discusses the possible effects of the agreement. No. 5, Wartime Policies and Controls Affecting Agricultural Trade, by M. Ogden (pp. 175-192), deals with the policies of and controls used by different countries—control of imports and exports, obstruction of trade of neutral countries, control by international agreements, etc.—and the possible use of such controls after the war; Cotton Control in the United Kingdom, by J. H. Richter (pp. 193-204), "presents a simple factual account of the history of the controls since the outbreak of war in 1939"; and Grain Exports From the Soviet Union, by L. Volin (pp. 205-214), describes the exports prior to and since the 1914-18 war period, the cause of the declining exports, and the composition and geographical distribution of exports. No. 6, Wartime Aspects of Egyptian Agricultural Economy, by N. W. Hazen (pp. 217-249), discusses the production of and foreign trade in agricultural products, 1909-13 and 1934-38, the Anglo-Egyptian relations, the war measures affecting agriculture, the effects of the war on foreign trade, use of fertilizers and cost of living, and the trade with Germany, Italy, and the United States; and Rubber Regulation, by L. Bacon (pp. 250-260), deals with the characteristic features of the rubber industry, the Stevenson Plan applied within the British Empire, 1922-28, native v. estate production, and the International Rubber Regulation Agreement, effective June 1, 1934.

Land and fiscal problems in Reynolds County, Missouri, R. J. SILKETT. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 324* (1940), pp. 80, figs. 13).—"The objective of this bulletin is to describe and analyze land use and related problems in Reynolds County, and, so far as possible, to present factual information which may aid in the formulation of public policies directed toward a solution of such problems." It is the result of a cooperative agreement with the University of Missouri under which two committees were appointed to assist and advise on land utilization research. Reynolds County was selected for study as representative of the rougher part of the Ozark region of the State. The settlement and population of the county are described. The utilization of lands and the factors related thereto and the fiscal problems of local

government—tax base, rates, delinquency and sales, county revenue, costs of government, indebtedness, schools (equipment, teaching personnel, sources of revenue, indebtedness), and roads—are analyzed and discussed. The adjustments in progress are described, and future land use and needed institutional adjustments are discussed.

State aids and rural property taxes in Wisconsin, K. H. PARSONS, B. H. HIBBARD, and A. J. WALRATH (*Wisconsin Sta. Res. Bul. 138 (1941), pp. [2]+48, figs. 3*).—The growth and extent of State grants to local government units of Wisconsin, the support in three representative counties (Adams, Iowa, and Washburn), and the effects of such grants on tax levies on property in the areas are discussed. An analysis is made of the State aid to elementary and high schools, towns, highways, pensions, relief, and other charitable purposes.

The State aid to local governments increased from slightly less than \$2,400,000 in 1908 to over \$33,000,000 in 1938. The proportion of the total State revenue distributed as aid increased from 35 to 53 percent. The proportion of aid received from the general property tax decreased from 68 percent to nothing. The decreases, 1920-24 to 1937, in the general property taxes levied in the three counties studied ranged from 23 to 50 percent for towns, from 18 to 26 percent for villages and cities in two counties and an increase of 18 percent in one county, due in part to the growth of one municipality, and from 24 to 42 percent for the entire county. Two outstanding facts were brought out regarding the three counties—(1) the aggregate cost of local government has increased greatly in recent years, but due to aid from the State and Federal Government the total property levies have decreased; and (2) expenses of local government have been higher than they would have been without State and Federal aid, but much of the increase was due to greater services, such as better highways, better schools, more pensions and relief, etc.

'Round the world with cotton, I. W. DUGGAN and P. W. CHAPMAN. (Coop. Univ. Ga.). (*U. S. Dept. Agr., Agr. Adjust. Admin., South Div., 1941, pp. IV+148, figs. 128*).—This publication presents "in simple, nontechnical style, a story of cotton at home and abroad. It uses easily understood words, photographs, charts, and pictographs to tell in entertaining fashion what has happened to cotton since its legendary origin in India 5,000 yr. ago."

Production and marketing of dry peas in the Palouse area, W. W. RUFENER. (Coop. Univ. Idaho, U. S. D. A., et al.). (*Washington Sta. Bul. 391 (1940), pp. 55, figs. 4*).—This study was made to determine the status of the production and marketing of dry peas, the relation of the crop to other agricultural enterprises, to ascertain methods and practices of producing and marketing that will result in maximum benefit, and to evaluate the crop as a part of the permanent agriculture of the Palouse area in Washington and Idaho. The data were obtained from a number of sources, including a survey of 39 farms in 1938, records of different agencies of the U. S. Department of Agriculture, the Washburn-Wilson Seed Company, and individuals. The first part discusses the position of the area in the United States production of dry peas, the relation of the industry to land use and livestock production, the effects of biological factors on production, and cultural, seeding, and harvesting practices. The second part discusses market uses of dry peas, preparation for market, sales methods, market areas, imports and exports, surpluses, and prices.

Palouse area farms complying with the Agricultural Conservation Program in 1937 showed that summer fallow land constituted 10 percent of the cropland of commercial pea farms and approximately 27 percent of that of other farms. With the possible exception of 1938, pea production has proved de-

cidedly profitable for the area as an alternative to summer fallowing. A cash-crop wheat and pea farming system for the area will result in soil deterioration, especially that due to soil erosion, but the production of peas only for seed and human consumption should permit adequate soil conservation. The outlook for material expansion in market outlets for dry peas is poor. On the basis of the 1934-38 demand and production, particularly for seed and human consumption, the market outlets for Palouse-grown dry peas should be available for about 2,000,000 bu. annually. This amount would require from 115,000 to 120,000 acres of harvested peas.

"The production of dry peas has a definite place in the agriculture of the Palouse area. Peas as part of an agricultural program can best be used as an alternative to summer fallowing and should provide a cash crop secondary only to wheat. Then, to conserve the soil and to provide for prospective market outlets, pea acreage should not exceed one-sixth of the cropland of the Palouse. To utilize soil-conserving crops and pea byproducts most efficiently, livestock production should be included as part of the farming system."

Farm organization and costs and returns in producing potatoes in central Maine, 1938 (*Maine Sta. Bul.* 400 (1940), pp. 253-254).—In this study by W. E. Schrupf, brief comparisons are made of acreages in potatoes, number of animal units, value of tractive power, varieties of potatoes grown, percentage of total receipts derived from potatoes, and the average labor income in 1929-30 and 1938 on 14 farms.

Rice and wheat in world agriculture and consumption, V. D. WICKIZER (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 17* (1941), No. 6, pp. [2]+261-314, figs. 7).—"The World War of 1914-18 focused attention upon the importance of wheat in the food position of Western nations and gave impetus to study which has greatly increased understanding of the world wheat situation. Despite the war developments of 1937-41, much less is known of rice, a food crop of comparable importance in the world as a whole, and of far greater importance in the Orient. This comparative study, therefore, focuses on the rice world centering in Monsoon Asia. Rice and wheat together constitute the major element in food supplies for four-fifths of the world's population. Changes in their positions and prospects, aside from their immediate strategic or military importance, have considerable long-term significance. . . . Per capita consumption of wheat and rice alike has tended to decline, though for quite different reasons. The decline in wheat consumption has been largely voluntary; the decline in rice consumption has not. Herein are considered the numerous trends in and problems of national nutrition, population, agricultural adjustment, trade development, and international politics which lie behind and explain changes in consumption of the two cereals, as well as competitive relationships which seem destined to assume greater importance in the future."

Wheat production in Oklahoma, 1894-1938, K. D. BLOOD and M. L. HILL (Coop. U. S. D. A.). (*Oklahoma Sta. Cir.* 92 (1941), pp. 51, figs. 4).—This circular consists primarily of tables showing by years, 1919-38, the acreages of wheat planted and harvested and the yields per acre and total by counties and districts. Other tables show similar data for the State by years, 1894-1938, and by districts, 1916-18.

Effects of the war on California fruit industries, S. W. SHEAR, S. HOOS, and H. R. WELLMAN (*California Sta. Mimeog. Rpt.* 74 (1941), pp. [1]+IV+97).—The chief export markets prior to the war, the major developments, September 1, 1939, to April 1, 1940, and April 1940 to January 1941, the domestic demand outlook, prospects during the remainder of war for exports and domestic demand, the possible post-war development, and the possibilities of increased fruit con-

sumption are discussed. Supplements include a chronology of political and economic developments during the war to the first week in January 1941 and a description of the wartime regulations and restrictions on fruit imports of European and South American countries and Canada.

Some of the tentative conclusions reached were (1) fruit exports to Europe during the remainder of the war will be uncertain as to amount and timing, and the total will probably be small; (2) exports to other countries are likely to decrease, at least slightly; (3) increases in consumer incomes in the United States cannot be expected to entirely offset the losses in European export demands for California fruits—dried fruits, pears, apricots, and certain canned fruits are likely to suffer most; (4) with the return of peace, fruit exports to Europe will probably increase, particularly if a large amount of credit is extended for reconstruction, but it will be limited by the impoverished condition of the masses of the people and perhaps of the continuation of war trade restrictions—it is questionable whether the pre-war demand for California fruits will be regained for a decade, if ever; and (5) increased consumers' incomes, wider knowledge of nutrition, and reduced costs of production, transportation, and marketing will assist in increasing domestic demand.

Situation and outlook for selected fruits and nuts, with special reference to the war, H. R. WELLMAN and S. HOOS (*California Sta. Mimeog. Rpt. 75 (1941), pp. [2]+48*).—This is a companion bulletin to that noted above and deals with citrus fruits and unshelled walnuts, which are exported from the United States in only small volumes, and almonds, avocados, dates, olive oil, and shelled walnuts, which are on an import basis. The loss in exports of citrus fruits to Europe is likely to be offset within a relatively short time by increased domestic demand, but prices to growers may not rise appreciably, since the trends in production are sharply upward. From 1934-35 to 1938-39, the United States production accounted for 58 percent of the total disappearance of almonds. Most of the imports were from Italy and Spain. The absence of imports favors larger United States production and increased prices, but adequate supplies of walnuts, imported Brazil nuts, pecans, filberts, and cashews are likely to retard the advance in the price of almonds. During the period 1934-38, about 95 percent of the total edible olive oil was imported from European countries. The British blockade, increased consumers' incomes, and the increased demand for canned ripe olives have put domestic olive oil at a premium, but the present situation is insufficient basis for increase in olive acreage. There were no imports from Europe, but the current domestic supply is ample to meet the demand for avocados. During the 5 yr. preceding the war, 88 percent of the dates consumed in the United States were imported from countries surrounding the Persian Gulf. After the war there may be additional pressure to export to the United States. Prior to 1935 the United States imported considerable quantities of unshelled walnuts as well as shelled walnuts, but in recent years the United States has been a net exporter of unshelled walnuts, chiefly to Canada and Europe. Imports of shelled walnuts were mainly from China and have remained at approximately the pre-war level. The increased supply of United States walnuts will tend to counteract the present prices resulting from the war and the expansion of consumers' money incomes.

Trends in production and foreign trade for meats and livestock in the United States, P. RICHARDS (*U. S. Dept. Agr., Tech. Bul. 764 (1941), pp. 64, figs. 15*).—The developments in foreign trade in livestock, meats, and lard before 1900, from 1900 to 1914, during the World War period, 1915-19, and since that date are discussed, special attention being given to trends in exports

from the United States, the restrictions to such exports due to Governmental activities, the changes in trade relations and tariffs, the increase in imports into the United States of cattle and beef, and the relation of exports and imports to domestic production and consumption. The long-time prospects for meat production, consumption, and foreign trade and the trends in production and consumption of lard and their relation to foreign trade are discussed.

Following the Civil War, livestock production in the United States expanded rapidly and exports of meats, lard, and live cattle increased materially. Since 1900 the increase in production has been relatively less and the trend in exports has been downward. Since 1900 the trend of total meat production has been upward, with most of the increase in pork, lamb, and veal. The increase in aggregate consumption has been greater than the increase in production, but less than the relative increase in population. With further increase in population in the United States, aggregate consumption of meats may increase somewhat, and imports of meats or meat animals may, over a period of years, be as great or greater than exports, but it is not expected that imports will become an important source for the United States' meat supply. The probable 1940 lard production in the United States is estimated to be about 23 billion pounds. During the predrought years (1934 and 1936) the domestic consumption of lard was about 1.7 billion pounds. While exports of lard after the war will probably continue in larger volumes than exports of pork, they are not likely to reach the volume of the late 1920's and early 1930's. The production of fats and oils directly from plants furnishes such competition with lard that lard in the future may have to be considered a byproduct in the production of pork, no more important than tallow in the production of cattle and beef.

Factors that affect sheep income, R. T. BURDICK (*Colorado Sta. Bul.* 467 (1941), pp. 27).—Tables are included and discussed showing the effects of different percentages of lamb crop, death losses, replacement of ewes, different sale weights, prices, etc., and combinations of these factors on the receipts and income from sheep.

Methods of raising colts economically, L. H. BLAKESLEE and J. E. BREWSTER (*Michigan Sta. Quart. Bul.*, 23 (1941), No. 4, pp. 240-242).—The results of two series of experiments using 24 draft foals sired by purebred draft stallions and 24 colts of Dakota range mares and purebred Belgian stallions and in which the colts were fed on different rations are reported. A table shows the average daily and total gains and the costs for grain, hay, and other roughage with each ration.

A monthly standard for squab production, C. S. PLATT (*New Jersey Sta. Hints to Poultrymen*, 28 (1941), No. 3, pp. [4]).—Tables show by months the number of squabs marketed, average dressed weight, price received per pound, quantity and cost of grain and grit fed per 100 pairs of breeding pigeons, and the percentages of eggs broken, infertile eggs, dead embryos, dead squabs, and market squabs. The tables are based on the records for 1940 of the New Jersey State Pigeon Breeding Test. The rations used January-September and October-December are given.

Trends in dairying by major type-of-farming regions, W. F. FINNER and R. L. MIGHELL (*U. S. Dept. Agr., Tech. Bul.* 751 (1941), pp. 27, figs. 5, map. 1).—The trends from 1928 to 1939 in dairy cow numbers and milk, cheese, and evaporated milk production by regions, the disposition of the increases, and the changes in selected areas—Cabot-Marshfield area, Vt., Dodge County, Wis., northeastern Texas, south central Tennessee, and east central Mississippi—are discussed. A map showing the regional and subregional classification of the types-of-farming areas of the United States is included.

From 1928 to 1938, total milk production in the United States increased about 12 percent, and that of cheese, evaporated milk, and minor dairy products at a much higher rate, while the production of butter (farm and factory) and the utilization of milk and cream as fluid milk increased at less than the average rates. About 75 percent of the increase in the number of cows was in the dairy region, Cotton Belt, Corn Belt, and general farming areas. About 65 percent of the increase in milk production was in the first three areas.

Supply responses in milk production in Dodge and Barron Counties, Wis., R. P. CHRISTENSEN and R. L. MICHELL. (Coop. Wis. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 750 (1941), pp. 94, figs. 22*).—This study is part of an investigation of the interregional competition in the production of dairy products in the midwestern part of the United States and the New England dairy region taken as a whole. The method of study is the same as that used in the study of the Cabot-Marshfield area of Vermont (*E. S. R.*, 83, p. 555). Barron County represents conditions where other alternative enterprises to dairying are of minor importance and Dodge County an area where there are several alternative lines of production. The agriculture of each county is described, and the past trends in milk production and the prospective trends in production—trends under way not directly related to price changes, effects of prices, results of individual farm budgets, normalization of adjustments, etc.—are discussed. The reliability and application of the findings are appraised.

In Dodge County milk production increased 18 percent during the previous 10 yr. The increases in milk production by 1946 may be expected to be about 8 percent if the present price relationships continue and 20 percent if milk prices are 20 percent higher. With milk prices 20 percent lower, a decrease of about 7 percent is expected in milk production. In Barron County it is estimated that milk production in 1946 will be nearly 9 percent higher with a continuation of normal 1936 prices, about 18 percent higher with prices 20 percent higher, and about the same as at present with prices about 20 percent lower.

Cotton quality statistics, United States, 1939–40. (Coop. Ariz., Ga., La., Miss., N. Mex., N. C., Okla., S. C., and Tenn. Expt. Stas.). (*U. S. Dept. Agr., Agr. Market. Serv., 1940. pp. [2]+71, figs. 10*).—This report continues the series on grade, staple length, and tenderability of cotton (*E. S. R.*, 83, p. 693). Figures are included for the first time on the grade and staple length of the supply (carry-over plus crop) and the disappearance of upland cotton.

Quality of cotton produced in New Mexico, 1936–1939, F. LOWENSTEIN and J. C. OVERPECK. (Coop. U. S. D. A.). (*New Mexico Sta. Bul. 274 (1941), pp. 26, figs. 3*).—This is a continuation of the study previously noted (*E. S. R.*, 72, p. 408). Data for each year and the entire period are included for the State and each of two principal cotton-producing areas as to staple and grade by crop years and specific periods and as to the production and distribution of pure seed. The percentages for the State and the United States for the period were cotton classed as strict middling or above 62.1 and 20.7 and as 1 in. or longer 90.9 and 43. A large percentage of the cotton in the State classed as $1\frac{1}{16}$ in. and longer was middling or better. Most of the $1\frac{1}{8}$ in. and longer cotton was ginned before December 1.

Cotton storage in Tennessee, C. E. ALLED and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 127 (1941), pp. [1]+III+43, figs. 10*).—The location, capacity, and functions of warehouses; storage and compression charges; distribution, trend, and length of storage; reasons why farmers store or do not store cotton; and some factors affecting volume of cotton storage are discussed.

Marketing field seed in the Knoxville area, I, II. C. E. ALLRED and B. H. LUEBKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monogs. 124 (1941), pp. [I]+II+35, figs. 11; 126 (1941), pp. [I]+III+38, figs. 45*).—Part I, Supply, Distribution, and Regulations, "gives information on the amount and origin of field seeds handled by wholesalers of the Knoxville trade area, the agencies and facilities for handling seed, and discusses the possibilities of greater local production." The data were obtained through interviews from Knoxville wholesale seed houses, seed dealers of the Knoxville trade area, seed cleaners, railroad representatives, agricultural agents, and seed growers in east Tennessee.

Part 2, 23 Individual Seeds, deals with supplies, prices, and distribution of 23 kinds of seeds.

Marketing husked sweet corn, K. C. BARBONS (*Michigan Sta. Quart. Bul., 23 (1941), No. 4, pp. 233-240, figs. 4*).—The preparation for market, especially the advantages of the use of cellophane packages, is discussed.

The grade and condition of some commercial packs in Michigan apples in mid-winter, R. E. MARSHALL and C. BOLANDEB (*Michigan Sta. Quart. Bul., 23 (1941), No. 4, pp. 223-229, figs. 3*).—Twenty-six random-selected bushel packs from seven storages of packing organizations in Berrien and Van Buren Counties were graded by representatives of the department of horticulture of the station during the first half of January 1941. Eleven of the original packs exceeded the tolerance in the Federal grade specifications for size and 5 that for color, but more than 10 percent of the fruits in 50 percent of the containers were defective for defects other than size and color. Of the apples shipped by express, 54 percent were badly bruised or skin-punctured as compared with 7 percent for those transported by automobile. Of the 26 bu., 13 were free from decay when examined. The studies showed that some of the fruit was not graded carefully enough to meet grade specifications and permitted tolerances and that the methods of packing the eastern apple box should be changed to avoid serious bruising.

Knoxville wholesale fruit and vegetable market.—III, Supply; IV, Facilities, C. E. ALLRED, B. H. LUEBKE, and W. S. CRAWFORD (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monogs. 119 (1940), pp. [I]+II+38, figs. 24; 120 (1940), pp. [I]+II+30, figs. 9*).—These bulletins continue the series (E. S. R., 84, p. 408). Part 3 "analyzes supply aspects of the market; the amount, composition, rate, and regularity of movement, including the use of the market by farmers. These factors are treated in relation to problems of fruit and vegetable production, competition with other regions, and possibilities for increased production."

Part 4 describes the Western Avenue Market and discusses the factors affecting probable volume of business and feasibility of constructing storage and processing facilities.

Some economic considerations affecting the marketing of Oregon dried prunes through cooperative dried-prune-packing associations, D. B. DELOACH and C. W. PETERS. (Coop. U. S. D. A.). (*Oregon Sta. Bul. 378 (1940), pp. 32, figs. 4*).—This survey is a phase of the study of cooperative fruit and vegetable associations previously noted (E. S. R., 85, p. 553), and deals with nine dried-prune-packing associations of the State. It is based on a survey made in 1940, but the financial records cover only the fiscal years 1936-38, inclusive. The production trends, effect of size of prunes on prices, packing, the organization and financial structure of the associations, the returns to growers, and the factors affecting such returns are analyzed and discussed.

During the period 1928-37, inclusive, Oregon produced approximately 9 percent of the prune production on the Pacific coast, which was about 90 per-

cent of the world production. The nine associations studied packed on an average 25 percent of the prunes packed in the State. The return from the 20-30 size Italian prunes was nearly 2.5 times that of the 40-50 size. Capital stock as evidence of members' equities was used by only one association. Eight of the associations operated on revolving funds. The combined average fixed assets (six associations) during the period 1936-38 was approximately \$38,000. The investment in fixed assets per member varied from \$67.52 to \$337.95, and that per ton of prunes handled from \$12.84 to \$47.40. The returns to growers were contingent on the market prices of different grades of prunes and costs of marketing. Prices of Oregon prunes were dependent on California prices. The per-ton cost of packing varied inversely with the tonnage handled. The commodity and operating credit was obtained from community or large Portland banks. No collateral was required, but the Oregon Prune Exchange was cosigner with the individual association. Credit needs were met more satisfactorily by the commercial banks than by the Spokane Bank for Cooperatives as the requirements were relatively small and for short periods.

Economic problems affecting poultry marketing in California, J. M. TINLEY and E. C. VOORHIES (*California Sta. Bul.* 642 (1940), pp. 204, figs. 42).—The development, location, trends, and characteristics of the chicken industry, poultry classification, etc., in the United States and California are described. The trends of chicken prices, the seasonal variation in farm prices of chickens, the wholesale price quotations, retail chicken prices, cold-storage holdings of poultry, and the relations between wholesale poultry quotations in California and on the New York and Chicago markets are discussed. The marketing methods and channels in California and the handlers of poultry, supply factors, seasonal supplies, and price determination and quotations in the Los Angeles and San Francisco markets are discussed, and the prices and quotations of the Los Angeles Produce Exchange are compared with those reported in the Federal-State Market News Service.

Marketing cooperatives, D. F. BLANKERTZ (*New York: Ronald Press Co.* [1940], pp. XIV+488, figs. 5).—This volume "attempts to give a comprehensive view of all phases of cooperative activity among both farmers and consumers." Part 1 deals with the origins and implications of cooperative marketing; part 2 with the types of farmers' cooperative associations and the principles and organization of sales associations; part 3 with the membership, financial, pooling, and sales and advertising policies and problems of sales associations, the cooperative control of production, and the legal aspects of farmers' cooperatives; part 4 is a survey of livestock, grains, dairy products, and other cooperative marketing associations; and part 5 a survey of types, principles, policies, etc., of farmers' and consumers' purchasing associations, credit, insurance, health, housing, educational, and other associations. Part 6 discusses the elements of weakness and success, the possibilities and limitations, and the future of cooperative associations. Appendixes include an organization agreement, a marketing agreement, a table showing the number and estimated membership and valuation of business, 1938-39, of farmers' marketing and purchasing cooperatives, and a list of bibliographies.

Business policies of country grain elevators, L. J. NORTON (*Illinois Sta. Bul.* 477 (1941), pp. 277-508).—This bulletin was based largely upon analyses of yearly audits of from 83 to 106 farmers' elevator companies during the years 1935-39. The functions and services that should be performed by elevators, the size of business that should be handled, the gross margins that should be earned, the sales and collection policies, the policies as to the accumulation of capital and distribution of earnings, and plans for increasing membership are discussed. Some of the findings as to Illinois elevators and suggestions were:

Unless a minimum of about 300,000 bu. of grain is handled per year or the business is very economically operated, additional functions or services besides receiving and shipping grain are required to make profit. The most successful companies combine a large grain business and a substantial merchandising business. Many companies do not take advantage of the opportunity to store grain and do not fully use their storage capacity. Storage of soybeans for mills and other grains under the normal granary program offer opportunity for fuller use of storage capacity. Grinding feed is a good side line. Capital requirements for handling merchandise were increased about \$1 for each \$3 of merchandise sold. Unit costs of operation decreased with increase of volume of business. Volume of business, except corn, did not appear to be built appreciably on a competitive basis. There was a tendency for margins to increase on certain lines of merchandise as the volume of business increased. Elevators must adjust their operations to changed transportation methods. Cooperatives, to be successful, must give more attention to membership relations and to better methods for obtaining new members.

[Report of the Federal Surplus Commodities Corporation for the fiscal year 1940] (*U. S. Dept. Agr., Fed. Surplus Commod. Corp., 1940, pp. [2] + 10*).—This report describes the direct purchase and distribution programs and includes tables showing by commodities the quantities and value under direct purchase and distribution programs during the fiscal year 1940 and from October 3, 1933, through June 1940, the distribution by States and the number of families and individuals served, the distribution for school lunches and number of schools and children served, the number of areas, participants, and value of surplus food and cotton stamps issued by months, May 1939–June 1940, and the estimated quantities of different products purchased with food stamps.

Crops and markets, [December 1940–June 1941] (*U. S. Dept. Agr., Crops and Markets, 17 (1940), No. 12, pp. 257–316, figs. 2; 18 (1941), Nos. 1, pp. 24, figs. 3; 2, pp. 25–56, figs. 7; 3, pp. 57–76, figs. 4; 4, pp. 77–96, figs. 2; 5, pp. 97–116, figs. 2; 6, pp. 117–140, figs. 2*).—Each number includes the usual reports as to different crops, livestock and livestock products, prices received by farmers, and the market reports for cotton, dairy and poultry products, feed seed, grain, and livestock and livestock products. No. 12 includes tables showing the estimated production and costs of production in 1939 by States for corn, wheat, oats, and cotton. No. 2 includes an article on Cash Farm Income in 1940, with tables showing the income by years, 1937–40, by crops and by States from different crops, kinds of livestock, and Government payments. The receipts, all sources, were for 1937, \$9,154,867,000, 1938, \$8,134,048,000, 1939, \$8,668,434,000, and 1940 (preliminary), \$9,119,908,000; those for 1940 from crops \$3,535,712,000, livestock and livestock products \$4,818,392,000, and Government payments \$765,799,000. No. 4 includes a table showing the indexes by States of the estimated value per acre of farm real estate. The numbers in Vol. 18 include data as to the amount of labor employed on farms, supply of and demand for farm labor, and wage rates. No. 6 includes tables showing farm wage rates, 1910–41, by specified geographic divisions and hog-corn ratios, 1938–40.

Index numbers of prices and production of farm products in Kentucky, D. G. CARD, A. J. BROWN, and O. M. FARRINGTON (*Kentucky Sta. Bul. 411 (1941), pp. 39, figs. 10*).—The data as to prices and price relatives previously noted (*E. S. R., 84, p. 117*) are combined into price indexes for 28 farm products, individually and by groups, and for all products. The indexes of production of selected groups of products are also included.

Prices and costs for Michigan farmers, O. ULREY (*Michigan Sta. Quart. Bul., 23 (1941), No. 4, pp. 211–222, figs. 4*).—The indexes of prices received and

costs of producing Michigan farm products (E. S. R., 78, p. 866) are brought up through March 1941.

Deciduous fruit statistics as of January 1941, S. W. SHEAR (*California Sta. Mimeog. Rpt. 76 (1941), pp. [2]+104*).—This is the third compendium of statistics of 10 selected fruits (E. S. R., 83, p. 267). Some data on all fruits, including citrus fruits, are also included, as well as additional tables on exports. The compendium supplements the fruit statistics published by the U. S. Department of Agriculture in *Agricultural Statistics* and the *Yearbooks of the Department*.

Seasonal variation and economy of basic feeds, 1924–1940, H. M. HAAG and N. ST. JOHN (*Missouri Stu. Bul. 422 (1941), pp. 43, figs. 18*).—The 14 feed-stuffs covered by this study were corn, wheat, oats, bran, shorts, gluten feed, cottonseed meal, soybean meal, linseed meal, tankage, meat scraps, timothy hay, mixed clover and timothy hay, and No. 1 alfalfa hay. The prices of grains were obtained from *Crops and Markets* and those of other feeds by tabulations of daily price quotations from the *St. Louis Daily Market Reporter*, the *St. Louis Globe-Democrat*, or records of private manufacturers, January 1924–December 1940 (cottonseed, linseed, and soybean meals and gluten feed for shorter periods). Tables and charts show for each feed the average annual prices, the monthly prices and indexes, the seasonal variations, the average costs of protein and nonprotein materials as determined by prices of corn and cottonseed, the average indexes of economy of each feed by years and other periods, 1930–39, 1930–34, and 1935–39, and the monthly and seasonal variations for each feed. The methods of calculating seasonal variations and indexes of economy are described.

The study showed that (1) for a given period of years certain feedstuffs tend to be cheaper sources of nutrient, and (2) that certain feeds are relatively more economical in certain months of the year.

RURAL SOCIOLOGY

Recent trends in population distribution in California, N. MERKOWICH (Univ. Calif.). (*Geog. Rev., 31 (1941), No. 2, pp. 300–307, fig. 1*).—The history of the peopling of California has been that of a continuous movement in number and space marked by new forces finding expression in new forms of population distribution. "The original distribution of the native Indian population had first been disrupted by the process of missionization and Spanish-American colonization. In the period 1835–1848 the tendency of the population to concentrate in the plains of central California and around the pueblo of Los Angeles was apparent. After the discovery of gold at Coloma (1848) the population center of California moved definitely to the foothills of the Sierra Nevada and the lowlands between the 'Mother Lode Country' and the Pacific Ocean. . . . The following decades were characterized by a 'filling' of almost all the habitable parts of the State by its settlers and newcomers. The limits of settlement were widened by continuous deforestation and by irrigation of desert land. The most daring enterprise was the creation of the rich Imperial Valley in the northern part of the Sonoran Desert. In the post-war period wave after wave of newcomers reached this last American frontier: Mexicans, southern Negroes, Filipinos, Midwesterners, and, most recently, the 'Dust Bowlers.'" The leader discusses urban growth in southern California, the deconcentration in the San Francisco area, the repopulation of the mountain regions, and the peopling of the Great Valley by migrants.

Planning for family relocation (preliminary report on procedures followed and results obtained in evacuation of the basin of the Wappapello Dam, Wayne County, Missouri), E. A. WILKENING and C. L. GREGORY. (Coop. U. S. D. A.). (*Missouri Sta. Bul.* 427 (1941), pp. 51, figs. 3).—Most of the families requiring assistance for relocation and readjustment in the Wappapello area because of the construction of a flood-control dam have been interviewed by local welfare agencies in an effort to extend whatever services were available in helping them out of their dilemma. A large number have received financial aid in the form of relief, grants, and loans. They have also been advised with respect to finding new locations and given the services of public health agencies. Families have also been assisted in analyzing their own problems objectively.

It is stated that unless specific attention is given to problems of family displacement, the social good presumed to accrue from the project as a whole is likely to be in part nullified by the social disadvantages accruing to the people displaced. Special consideration needs to be given to those families without adequate resources for moving and relocating.

Proceedings of the 1940 conference on low-income farms (*West Virginia Sta. Bul.* 299 (1941), pp. 46).—Included are the discussions at the conference held at Morgantown, W. Va., July 15–17, 1940, on Needed Research Among Low-Income Rural Families, by F. F. Lininger (pp. 6–11); The Low-Income Farm Situation in West Virginia as We Know It, by W. W. Armentrout (pp. 12–16); How the Extension Service Is Working With Low-Income Farmers, by J. O. Knapp (pp. 16–19); How the Farm Security Administration Is Working With Low-Income Farmers, by R. G. Ellyson (pp. 19–24); The Scope and Method of Research That Should Be Employed on the Low-Income Farm Problem, by T. W. Schultz (pp. 25–27); What Is Ahead for Agriculture in the Appalachian Region in View of the World Situation? by J. D. Black (pp. 27–34); The Scope of Cooperation That Should Be Solicited on the Research Project, by S. Johnson (pp. 35–40); and Summary of the Research Conference on Low-Income Farms, by W. I. Myers (pp. 40–46).

Man in the "cut-over": A study of family-farm resources in northern Wisconsin, G. W. HILL and R. A. SMITH (*Wisconsin Sta. Res. Bul.* 189 (1941), pp. [2]+71, figs. 7).—The authors discuss the cut-over as a problem area of 18 counties, classes of families, occupation patterns, achievements and attitudes, and neighborhood-community processes as observed in Little River, Scandenburg, and Polandville.

The English settlement at Rugby, Tennessee, E. I. MILLER (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 128 (1941), pp. [1]+1+37, figs. 2).—This report deals with a settlement in 1880 by an English group headed by T. Hughes on the Cumberland Plateau in Morgan, Fentress, and Scott Counties, Tenn., which represented a definite attempt to combine industry and agriculture. The type of settler which the colony was designed to attract was decidedly different from the type usually associated with such projects, and other immigrant colonies on the plateau were of German and Swiss origin. The original plan called for the purchase of 400,000 acres, but actually only 40,000 were obtained. The settlement collapsed in 1891. Among the chief factors of failure were selection of settlers without agricultural background and training; absentee management, plus a lack of aggressive leadership in the colony; an overemphasis on town planning and lack of attention to the broader problem of sound development of area resources, particularly the forest products; lack of adequate transportation and market facilities for the type of crops proposed; difficulties in securing clear titles to land; division of land into holdings too

small for type-of-farming adapted to the area; overestimating the capacity of the range for livestock, with no provision for supplementary feeding; and lack of an intense desire, on the part of many of the settlers, to make the colony a success.

Basic trends of social change in South Dakota, VII, VIII, W. F. KUMLIEN (*South Dakota Sta. Buls.* 347 (1941), pp. 31, figs. 11; 348 (1941), pp. 24, figs. 6).—These bulletins continue the series previously noted (E. S. R., 83, p. 696).

VII. Local government.—In all phases of government studied there were evidences of growing centralization. State and county governments have taken over most of the functions of the township, the State has increased control over the county in certain fields, and the Federal Government has strengthened its control. The costs of State and local governments increased greatly up to 1930, declined during the depression, and then began to rise again. Many functions of government have changed historically, and the government has taken over many functions which it did not previously perform. Changes in the social order are a confusing factor to the smooth operation of democracy in South Dakota.

VIII. Religious organization.—The author concludes that both church and Sunday-school members have declined in numbers in proportion to the total population. A distinct relationship between denominational preference and nationality background was evident. The number of churches has decreased, and the average church budget has declined in amount. On the other hand, church programs have tended to become more realistic and community-centered. Ministers have begun preaching less theology and doctrine and have included more discussion of present-day social problems and world events. The ministers now have more professional training.

Utah youth study initiated, J. A. GEDDES (*Farm and Home Sci. [Utah Sta.],* 2 (1941), No. 2, pp. 1, 11, fig. 1).—From the natural increase in Utah, the ratio between numbers and resources is maintained and a surplus produced which moves out of State. The youth problem in Utah is no longer an individual one but one involving social responsibility. Further information is being gathered.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the Association of Land-Grant Colleges and Universities (*Assoc. Land-Grant Colls. and Univs. Proc.*, 54 (1940), pp. [1]+V+351).—This report of the fifty-fourth annual convention held in Chicago, Ill., November 11-13, 1940 (E. S. R., 84, pp. 1, 145), includes abstracts (in a few cases complete papers) of papers and discussions presented in the general sessions and in the sections and subsections on agriculture, resident teaching, experiment station work, extension work, engineering, home economics, and graduate work; the minutes of the executive body, including reports of committees and lists of officers and committees for 1941; and memorials to Jacob Elry Metzger, James McLellan Hamilton, Charles Mercer Snelling, Guy W. Bailey, and Glenn Frank.

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1940-41, B. T. RICHARDSON (*U. S. Dept. Agr., Misc. Pub.* 420 (1941), pp. V+174).—This is the usual annual list (E. S. R., 83, p. 559) showing the workers in agriculture and home economics, the personnel of the Office of Experiment Stations, and the officers and standing committees of the Association of Land-grant Colleges and Universities.

Forestry for 4-H Clubs, W. R. MATTOON and E. H. SHINN (*U. S. Dept. Agr., Misc. Pub.* 395 (1941), pp. [4]+50, figs. 32).—Superseding Department Bulletin 863 (E. S. R., 44, p. 94), 12 projects for use of 4-H Clubs are outlined showing

the aim, sources of information, illustrative material, guides to study, practical things to do, field studies, etc. A list of available publications on forestry on farm woodlands, log scale tables, a key to common kinds of trees, by W. H. Lamb, and a table showing the names, distribution, and characteristics of 100 eastern forest trees are included.

FOODS—HUMAN NUTRITION

[Foods and nutrition studies by the Florida Station] (*Florida Sta. Rpt.* 1940, pp. 77-99).—In this annual report summaries, representing for the most part an extension of earlier work (E. S. R., 83, p. p. 699), are given by O. D. Abbott, M. R. Overstreet, and R. B. French on the nutritional status and dietary habits of rural school children in four counties of the State and of 4-H Club girls attending camp on the west coast, by Overstreet on the effect of improved nutrition on the school progress of a group of grade school children, and by Abbott and French on the composition of royal jelly.

[Foods and nutrition studies by the Maine Station] (*Maine Sta. Bul.* 400 (1940), pp. 229-248, 263-264, figs. 2).—These progress reports (E. S. R., 83, p. 410) summarize a continuation by M. M. Clayton of the investigation of food habits and nutritional status of children in selected communities in Maine and a study of the effect of sodium chloride and vinegars on the oxidation of ascorbic acid in pickles, green peppers, and cabbage; further discussion by W. F. Dove of the relation of man and animals to the environment under the topics extra nutritional determiners of malnutrition, the need for vitamin A foods and food crops and the genetic selection for varietal differences in carotene content, and requirements for the production of aggridant foods; and studies by M. D. Sweetman on the mealiness of potatoes as affected by fertilizers.

Composition of some common foods with respect to the carbohydrate content, T. M. CARPENTER (*Jour. Nutr.*, 19 (1940), No. 5, pp. 415-422).—Analyses, incidental to the study noted on page 604 are here reported showing the composition and energy value of 22 kinds of common foods. Moisture, protein, ether extract, ash, reducing sugars, hydrolyzable sugars, starch, and cellulose were determined by methods noted in cooked rice and macaroni, white bread, raw and cooked vegetables, nuts, dates, and figs. Heat of combustion was determined by oxycalorimeter. The results obtained are compared with previous analyses of similar foods by other investigators.

The nutritive value of the egg, S. K. KON (*Chem. and Indus.*, 59 (1940), No. 21, pp. 360-363, figs. 3).—This discussion considers the food value of the egg in terms of its dietary contribution of "good" protein, minerals, and vitamins.

The chemical composition of the egg, E. M. CRUICKSHANK (*Chem. and Indus.*, 59 (1940), No. 24, pp. 415-419).—Continuing the discussion noted above, this paper summarizes data on the proximate, mineral, and vitamin constituents of egg white and egg yolk, and considers also the shell and shell color, the properties of thick and thin whites, and the effect of the hen's diet on egg composition.

On the use of dry milk solids in sponge cake, O. E. STAMBERG and C. H. BAILEY. (Minn. Expt. Sta.). (*Bakers' Helper*, 73 (1940), No. 908, pp. 918-919, 923, fig. 1).—An average type commercial sponge cake formula was used as a basis for the study of the effect of inclusion of dry milk solids. A series of tests indicated that dry milk solids up to as high as 50 percent, on the basis of cake flour 100 percent, could be used, and that levels of 15 or 30 percent were very satisfactory, giving cakes that staled less rapidly than milk-free cakes and giving cake batters with greater stability than milk-free batters.

The best cakes resulted when 10 percent more water was used with each 15 percent of dry milk solids. As judged by measurements of specific volume of the cake, compressibility, and tensile strength and by the cake score, data for which are presented, the best results were obtained by beating the milk solids with the sugar and eggs. The milk solids were first mixed with the sugar and the mixture was prewarmed to 95°–100° F. before beating. Egg yolks gave better cakes and egg whites poorer cakes than were obtained with whole eggs. Medium beating speeds proved best.

The reducing-substance and phenolic-compound content of the potato tuber in relation to discoloration after cooking, C. O. CLAGETT and W. E. TOTTINGHAM. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 6, pp. 349–358).—Continuing the work to determine the cause of blackening in cooked potatoes (E. S. R., 82, p. 698), attention was directed to a study of blackening in relation to the presence of reducing substances (total and ascorbic acid) and of a catechol equivalent. Total reducing substances were determined by grinding a weighed sample in 3 percent sulfosalicylic acid and titrating the filtered extract with 0.01 M potassium iodate, using starch as an indicator. Ascorbic acid was determined by dichlorophenolindophenol titration and the catechol equivalent by treating 2 cc. of the tuber extract in a colorimeter tube with 0.5 N HCl, 10 percent nitrite-molybdate solution, and 1.0 N NaOH, the color developed after shaking and dilution being read in a photoelectric colorimeter.

Tests with the Wisconsin crop that had been stored for 9 mo. at 4.5° C., with Triumph and White Rose potatoes recently shipped to Wisconsin markets from the west coast, and with Rural New Yorker potatoes held in cold storage for 2 to 4 weeks after harvest showed no relation between blackening and total reducing substances, indicating that there was no protective effect of the total reducing function against the blackening response. A comparison of total reducing values of tissue from stem and bud ends of tubers commonly showing localized darkening in the former region likewise indicated that the darkening could not be ascribed to deficiency of reducing substances.

A substance or substances giving the catechol reaction was found concentrated in the epidermis and cortex of Rural New Yorker potatoes held in cold storage for 8 weeks after harvest. Reducing substances were not similarly concentrated. After 11 weeks of storage the degree of blackening after boiling correlated well with the amounts of catechol found. Samples taken as cores (to limit variation between epidermis-cortex tissue and the parenchyma tissue) in three varieties from two regions also showed, upon analysis, catechol equivalents proportional to the degree of blackening after boiling, although no such relationship was found in the matter of reducing substances in these core samples. Spectrophotometric procedures were found unsatisfactory for identification of the orthodihydroxy compound.

The banana in Chinese literature, P. K. REYNOLDS and MRS. C. Y. FANG (*Harvard Jour. Asiatic Studies*, 5 (1940), No. 2, pp. 165–181, pls. 3).

The banana in relation to human nutrition, H. R. BARNELL (*Trop. Agr. [Trinidad]*, 17 (1940), No. 8, pp. 143–146).—This brief review, with literature citations, considers the nutritive value of the banana, methods of storing the fruit, and composition in relation to quality.

Value of banana and banana powder in the treatment of infants and children having diarrhea: A two year clinical study, I. J. WOMAN and R. L. ROPPY (*Amer. Jour. Diseases Children*, 60 (1940), No. 2, pp. 333–340).—The subjects consisted of 97 infants and children who were given mashed banana or banana powder as the principal food and a control group of 80 who received

a variety of recognized therapies. Of the first group 56 and of the second 61 percent were under 1 yr. of age, and there were no significant differences between the two groups as regards etiologic factors, severity of the infection, state of nutrition, or mortality rate. Sick infants under 4 mo. of age could not take the mashed ripe banana readily but had no difficulty with solutions of banana powder. The older children ate the mashed pulp readily and in large amounts.

The clinical results of the two treatments as regards control of diarrhea were practically identical, but in the infants the symptoms of irritability and crying indicative of hunger were less prominent and in the older children colic, tenesmus, and abdominal discomfort became less marked with the banana treatment. The banana regimen is prescribed for infants under 2 yr. of age and older children.

Food and health from wild greens or pot herbs in New York State ([*Albany*]: *N. Y. State Dept. Health*, [pp. 4, figs. 13]).—This leaflet illustrates by line drawings and briefly describes 13 common wild greens, discusses their food value, and gives brief notes concerning their preparation for the table, cooking and canning, and their use in salads. A word of warning is given concerning poisonous and unpalatable greens.

Microbiology of paper and paper-board for use in the food industry, F. W. TANNER, E. WHEATON, and C. O. BALL (Univ. Ill. et al.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 3, pp. 256-266).—This address considers the bacteriological aspects of the various raw materials used in paper manufacture and the bacteriological analysis of paper. It is concluded that "paper and paperboard made for use in the food-packaging industries is a sanitary product of a high order. It is not only made from clean, sanitary, raw materials, but results from a manufacturing procedure in which are several absolutely lethal steps, i. e., cooking, bleaching with chlorine, and hot drying rolls. *Escherichia coli* is not found in paper so made."

Foods suitable for freezing preservation: Freezing locker plants, J. G. WOODBOOR (*Georgia Sta. Bul.* 212 (1941), pp. 34, figs. 14).—This bulletin presents a summation of practical aspects of food preservation by freezing. Twelve fruits, 20 vegetables, 7 fruit and vegetable juices, most meats and fish, sweet cream, butter, and eggs are described as products suitable for freezing, while raw vegetables for salads, alkaline vegetable juices, cheap cuts of meat and other products that do not justify the cost of this method of preservation are noted as unsuitable. It is pointed out that 10 or 12 of the products that can be successfully frozen can usually be economically produced in any one section of Georgia and that in this and surrounding States many communities are suited to the commercial production of from 3 to 5 vegetables, 3 or 4 fruits, and considerable livestock and livestock products, thus permitting the operation of a freezing plant most of the spring, summer, and fall months. "Brief directions are given for processing, storing, and serving frozen foods under conditions that prevail in the southern United States." In addition, for ready reference concerning these products, tables are given noting such points as the suitability for freezing, the form in which frozen, the treatment before freezing, suitable varieties, wrapping materials or containers, season of operation, weight losses in processing, and uses of the frozen product. "Directions are given for laying out a freezing locker plant, as well as a commercial freezing plant, together with cost figures and suggestions for operation."

[**Nutrition studies by the Arizona Station**] (*Arizona Sta. Rpt.* 1940, pp. 18-14, 78-82).—Included in these progress reports (E. S. R., 84, p. 121) are summaries of extensions of previously noted iron studies (E. S. R., 84, p. 276)

(pp. 80-81), and fluorine studies, the latter including the preparation of bone filter (p. 13), removal of stain from teeth (pp. 13-14), effect of the presence of fluorides in the drinking water of cows upon the fluorine content of the milk produced (pp. 14, 82), the absorption of fluorine by plants from soils containing fluorides or irrigated with high fluorine water (p. 14) and by foods from cooking water containing fluorides (p. 82), and fluorides in ground waters from different depths (p. 14). Preliminary studies are summarized on the effect of exposure of cows to sunlight on the vitamin D potency of milk (pp. 78-79) and on vitamin C metabolism in humans (pp. 79-80).

Nutrition as it relates to the eye, A. M. YUDKIN (*Med. Woman's Jour.*, 47 (1940), No. 5, pp. 176-182, 196).—This paper, presented before the 1939 conference of the National Society for the Prevention of Blindness, deals with various pathological conditions of the eye traceable to faulty nutrition, including night blindness, lesions of the cornea, retinitis pigmentosa, hemorrhagic retinitis, and cataracts. Several references to the literature are appended.

Blood: A review of recent literature, R. ISAACS, C. C. STURGIS, F. H. BETHELL, and S. M. GOLDFAMER (*Arch. Int. Med.*, 65 (1940), No. 6, pp. 1211-1294; 66 (1940), No. 1, pp. 173-225).—This extensive review presents material from selected articles published in 1939, with a few from previous years. It is pointed out that the trend of these studies was toward the experimental and chemical aspects of the physiology and pathology of the blood and of the blood-forming organs. One section, following those devoted to the various forms of anemia, deals with iron deficiency, giving consideration to iron metabolism and experimental anemia, hypochromic anemia of adults, anemias of pregnancy including nutritional anemia, and nutritional anemia of children.

The combustion of carbohydrates in man after ingestion of common foods, T. M. CARPENTER (*Jour. Nutr.*, 19 (1940), No. 5, pp. 423-435, figs. 5).—To secure information as to how quickly a certain amount of carbohydrate material in various foods would be available for combustion in the body, and how much carbohydrate would be burned in a given time, measurements were made, by the open-circuit helmet respiration apparatus, of the total respiratory exchange and urinary nitrogen elimination of a man before and after ingestion of various portions of common foods each containing approximately 25 gm. of available carbohydrates. The amounts of the different foods required for this purpose were calculated from existing food tables. Subsequent calculations based on actual analyses (noted above) of the foods, which were sampled for analysis at the time of serving, gave the amounts that should have been eaten to furnish exactly 25 gm. of available carbohydrates (sucrose, reducing sugars, and starch). Calculations, corrected to an exact 25-gm. basis, were made of the carbohydrate combustion in 12 successive 15-min. periods immediately after food ingestion, these values being compared with the carbohydrate combustion in the postabsorptive condition. This base line carbohydrate combustion in the individual experiments varied from 0.41 to 1.75 gm. per 15 min. and averaged 1.12 gm. The results showing the increase in carbohydrate combustion following the ingestion of food are presented by tabulation and by graph and are discussed with reference to the individual foods. In general the increases during the 3-hr. period following food ingestion were greater the greater the amounts of reducing and hydrolyzable sugars in the foods, and smaller the greater the amounts of starch or fat in the foods. Boiled carrots, sweetpotatoes, parsnips, beets, and squash caused greater increases than nuts, rice, macaroni, white potatoes, and bread. With cane sugar there was an immediate maximum rise in carbohydrate combustion to about 4 gm. per quarter hour in the second 15-min. period. This rise was greater than that with any of the other foods, and was followed by a sharp decrease, with an

approach to the base line after 1 hr. and a return to it at the end of 3 hr. With glucose, however, the maximum rise to a little more than 2 gm. per quarter hour did not occur until the sixth 15-min. period, decreasing thereafter, but still being appreciably above the base line at the end of 3 hr. Apparently glucose was first used to fill the glycogen reserves, after which it became available for combustion. With the vegetables, the readily digestible carbohydrates were burned first, and subsequently the more complex carbohydrates were liberated and made available.

Metabolism of d-mannoheptulose: Excretion of the sugar after eating avocado. N. R. BLATHERWICK, H. W. LARSON, and S. D. SAWYER (*Jour. Biol. Chem.*, 133 (1940), No. 3, pp. 643-650).—Fermentable and nonfermentable sugars were determined in the urines of 10 subjects after the ingestion of from 137 to 214 gm. of avocado (Trapp variety) and in 5 subjects after the ingestion of from 5 to 10 gm. of d-mannoheptulose, the sugar isolated from the avocado. Values for mannoheptulose, determined by the method outlined, agreed very well with those for the nonfermentable sugars when account was taken of the normal content of these latter substances in urine. The peak of excretion of mannoheptulose usually occurred in the 2- to 4-hr. period after ingestion of the avocado or the sugar, and the rate of excretion began to decrease after 6 hr. Within the 6-hr. period after ingestion of 5 gm. of the sugar, approximately 5 percent of it appeared in the urine. No greater amount appeared when 10 gm. was ingested. The fate of the remainder of the sugar was not determined. In the urines of subjects who had eaten avocado, the concentration of sugar was high enough to cause reduction of ordinary sugar reagents. It is pointed out that this is another source of confusion in the diagnosis of diabetes mellitus.

The iron content of the tissues of normal, anemic, and iron-enriched rats freed from blood by viviperfusion. M. E. AUSTONI, A. RABINOVITCH, and D. M. GREENBERG. (Univ. Calif.). (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 17-26, fig. 1).—Tissues of rats freed of blood by a viviperfusion technic, described in some detail, were dried and dry-ashed, and acid solutions of the ash were analyzed for iron by oxidimetric titration with titanium trichloride. Animals used for analysis represented normal rats from the stock colony, rats made anemic by rearing on a modified skim milk diet, and iron-enriched rats, these latter having been kept at reduced atmospheric pressure and having received 1 mg. of iron daily for 1 mo. previous to sacrifice. The results are tabulated on dry and wet bases to show range as well as mean values. Although there was great variability, the trend of values indicated that rats on diets deficient in iron showed decreased iron in the tissues as compared with normal rats, while those on diets supplemented with iron and kept under reduced pressure tended to show increased iron in the tissues. Liver and spleen were the most strongly depleted of the tissues in the anemic rats, but showed no significant increase in iron content in the iron-enriched animals, although the other tissues, especially bone marrow, did show gains associated with the enrichment regime.

Studies in iron metabolism with the aid of its artificial radioactive isotope: The absorption, excretion, and distribution of iron in the rat on normal and iron-deficient diets. M. E. AUSTONI and D. M. GREENBERG. (Univ. Calif.). (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 27-41, figs. 5).—With radioactive iron as an indicator, the absorption, distribution, and excretion of iron were studied in normal and iron-deficient rats. The Fe^{59} was produced by bombardment of iron phosphide with deuterons in the cyclotron and separated by a procedure noted. Samples of determined purity were administered in solution, chiefly as ferric chloride, in 2- to 8-mg. doses by stomach tube to

normal and deficient animals, which were then placed in individual metabolism cages and given the stock diet until sacrificed at intervals. Upon anesthesia a blood sample was drawn, the animal was viviperfused by the technic noted above, and the blood and separated tissues were analyzed for their radioactive iron content by a standardized analytical technic described. Radioactive iron in urine and feces was also determined.

The results, presented by graphs, showed that it required about 12 hr. for a single dose of iron to pass from the stomach and small intestine in normal rats and longer than this in anemic rats. The latter eliminated less of the administered iron in both feces and urine, the retention during a 10-day period being about 50 percent with the anemic animals as compared with about 30 percent for the normal animals. The greater part of the elimination through feces and urine took place within 48 hr. "The specific accumulation of the absorbed iron per gram of tissue was greatest in the bone marrow, blood, spleen, liver, and heart. The total accumulation was greatest in muscle and blood, particularly in anemic rats. After 10 days, the radioactive iron had nearly disappeared from the muscle and blood of the normal rats, but showed marked accumulation in the muscle (25 percent of administered dose) and blood (14 percent of administered dose) of the anemic animals."

Iron balances on four normal pre-school children, T. PORTER. (Mich. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 101-113).—Controlled iron balance studies were conducted on four children, 3 and 5 yr. of age, for 63 days, which were divided into nine 7-day experimental periods. The data showed average intakes for each period for each child ranging from 5.38 to 5.95 mg. per day, with an average for all children of 5.64 mg. per day. In terms of body weight, the levels of intake ranged from 0.22 to 0.42 mg. per kilogram, and averaged 0.31 mg. On these intakes varying amounts of the mineral were stored, averaging 1.24 mg. per day, or 0.07 mg. per kilogram per day. None of the balances was negative, although some of the retention figures represented equilibrium. The average level of retention represented about 22 percent of the intake of iron, the rest of the intake being largely unabsorbed and excreted as fecal iron. The amount thus excreted varied from 3.12 to 5.41 mg. and averaged 4.20 mg. per day. Urinary excretion was almost negligible, averaging only 0.20 mg. per day. The findings are interpreted to indicate that great anxiety over the need for providing impractically high levels of iron in children's diets is unwarranted.

Serum phosphatase, calcium, and phosphorus values in infancy, D. J. BARNES and B. MUNKS (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 327-331, fig. 1).—In a group of 390 hospital-born babies followed for a year in the out-patient clinic and known to be receiving adequate amounts of milk, vitamin D as cod-liver oil, and accessory foods as warranted, serum calcium values were determined at frequent intervals. These values averaged 11.3 mg. per 100 cc. of serum from birth to 3 days, fell during the second week to an average of 10.8 mg., and then rose to 12.1 mg. at the end of the first month, remaining fairly constantly at that level through the year. Serum phosphorus values averaged 6.4 mg. per 100 cc. at 0-3 days, 6.8 in the second week, 6.4 at 1 mo., and then established a fairly constant though falling level through the year, averaging 5.8 mg. per 100 cc. at 12 mo. Serum phosphatase in these infants averaged 7.1 units per 100 cc. at 3 days, showed a sharp rise to 11.9 units in the first 2 mo., a slow continuance of this rise to 13 units at the fifth month, and then a gradual though wavering decline through the rest of the year to a level of 11.5 units per 100 cc. At the eighth month there was a temporary sharp decline to 9.9 units.

Two hundred and forty infants sent to the clinic because they were thought to be rachitic and in need of treatment were not seen in the first 2 weeks, but following this period their serum calcium and phosphorus values were similar to those of the normal group. The serum phosphatase values of these welfare babies were, however, somewhat high in the first and second months, averaging 123 and 135 units per 100 cc. at these periods. At later periods the values corresponded very well with those of the normal infants. It is considered probable that the elevated serum phosphatase is the earliest reliable sign of rachitic activity, but that later on in the infant's life there is not the same relationship between slight physical signs and serum phosphatase values.

Ionization of calcium phytate, E. F. YANG (*Nature [London]*, 145 (1940), No. 3680, p. 745).—Investigations noted briefly showed that sodium phytate could only form an insoluble precipitate when an equivalent amount or an excess of calcium was added. Under these conditions the filtrates were clear and contained only a trace of phytic acid. When less than half the equivalent quantity of calcium was added no precipitate formed and the solution remained clear, and the calcium in the solution was not precipitable by phosphate or oxalate. This indicated complex ion formation with exceedingly slight ionization of calcium. Magnesium was found to behave like calcium in similar tests.

Ionization of calcium phytate, D. C. HARRISON and E. MELLANBY (*Nature [London]*, 145 (1940), No. 3680, pp. 745-746).—Commenting on the above findings, the authors indicated that they were in confirmation of their results reported earlier (E. S. R., 83, p. 426). It is suggested, therefore, that phytic acid may exert its rickets-producing action by actual precipitation of the calcium or by lowering the ionization and diffusibility of the calcium of the food. It may possibly act in both ways, the latter being of more importance at a faintly acid intestinal pH where precipitation of calcium would be less great.

The relation of the phosphorus turnover of the blood to the mineral metabolism of the calcified tissues as shown by radioactive phosphorus, R. S. MANLY, H. C. HODGE, and M. L. MANLY (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 293-299, fig. 1).—Theoretical interpretations concerning this relationship are postulated on the basis of phosphate changes calculated as percentages of the original dose of marked phosphorus found in each gram of tissue (blood, epiphyses, and diaphyses) at a specified time after administration. Curves showing percentage dose v. time for the several tissues are presented.

On the manner of acquisition of fluorine by mature teeth, W. W. PERRY and W. D. ARMSTRONG. (Univ. Minn.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 35-44).—Mature male rats were maintained on a ration of commercial dog biscuit, the controls receiving distilled water and the experimental animals water containing 20 p. p. m. of fluorine supplied as sodium fluoride. Data obtained upon analysis of enamel and dentin fractions of incisors and molars from these animals sacrificed after 60 days on these regimes are interpreted as follows:

"The molar teeth of rats fed an ordinary diet contain more fluorine in the dentin than in the enamel, but the reverse obtains with respect to the incisor teeth. The fluorine content of the dentin of molar teeth of mature rats is not increased when the animals are given water containing 20 p. p. m. of fluorine. The above facts show that a secondary enrichment of dentin with fluorine occurs after its calcification, and that the process does not continue indefinitely. The fluorine content of the enamel of mature erupted teeth (rat molars) is increased by fluorine which enters it through the surface when rats are given drinking water containing 20 p. p. m. of this element."

A method for staining of carious lesions in teeth, G. GOMORI (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 250-253, figs. 3).—The method de-

scribed is based upon the difference between sound enamel and carious areas in permeability to dilute silver nitrate solution. Teeth, or even whole jaws, fixed in alcohol or formalin, impregnated with from 0.25 to 0.5 percent silver nitrate solution for from 12 to 24 hr., reduced with 5 percent sodium hypophosphite for 24 hr., and fixed in 2 percent sodium thiosulfate (hypo) for 12 hr., show the enamel entirely unstained and the carious areas stained deep black. Exposed dentin at the tips of the cusps often shows a superficial staining. Such preparations admit of direct observation under the dissecting microscope following dehydration and clearing, or of sectioning after decalcification (preferably in from 5 to 10 percent sulfosalicylic acid), and embedding in celloidin. The sections may be counterstained with any stain desired.

A spectrochemical study of the normal ranges of concentration of certain trace metals in biological materials, R. A. KEHOE, J. CHOLAK, and R. V. STORY (*Jour. Nutr.*, 19 (1940), No. 6, pp. 579-592, fig. 1).—Mn, Pb, Sn, Al, Cu, and Ag were determined simultaneously by a sensitive spectrographic method¹¹ in normal human tissues (organs, bone, and muscle) from autopsy material and normal human blood and urine, all from subjects carefully checked for occupational history to eliminate contamination of industrial origin. Pb, Mn, Cu, and Al were present in all materials examined, while Sn was present in about 80 percent and Ag in from 10 to 20 percent of the samples. A liter of normal urine was found to contain on an average less than 0.01 mg. of Mn, and 0.078, 0.034, 0.027, 0.011, and 0.00 mg., respectively, of Al, Cu, Pb, Sn, and Ag. One-hundred gm. of blood averaged 0.114, 0.025, 0.015, 0.013, 0.012, and 0.00+ mg., respectively, of Cu, Pb, Mn, Al, Sn, and Ag, with most of the Mn, Pb, and Sn in the formed elements, Al almost entirely in the plasma, and Cu about evenly divided between the two, but with the formed elements usually containing a slightly higher concentration. Consecutive daily or weekly samples of urine and blood from the same individual did not show constant concentrations of these metals, but varied from sample to sample. Comparison of the mean daily quantities of these trace metals in successive samples of the feces and food (each analyzed as composite samples) of a normal adult American showed that the output in the feces was practically equivalent to the daily intake in the diet. Analyses of a number of samples of various foods of plant and animal origin and of a number of beverages showed the presence of Pb varying for the most part from traces to 1.8 p. p. m.; cocoa contained from 0.4 to 11.5 p. p. m. in the 25 samples analyzed, and 1 sample of dried tea leaves contained 43.2 p. p. m.; water standing unused in the pipes of a building for several days contained 0.37 to 0.92 p. p. m., although ordinary tap water contained from 0.02 to 0.05 p. p. m. Analyses of the soils, waters, and vegetation indicated the wide distribution of Pb.

Manganese, lead, tin, aluminum, copper, and silver in normal biological material, R. A. KEHOE, J. CHOLAK, and R. V. STORY (*Jour. Nutr.*, 20 (1940), No. 1, pp. 85-98).—The more recent work is reviewed, and pertinent facts concerning the normal occurrence of these metals in biological material are reviewed in relation to the findings of Kehoe et al. noted above.

An extensive bibliography is given.

The rôle of boron in the diet of the rat, E. ORENT-KEILES (*Soc. Exptl. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 199-202).—A synthetic diet very low in boron content (163 μ g. per kilogram) is described. Young rats consuming this diet for 34 weeks at an average daily intake of 9.6 gm. per male and 7.8 gm. per

¹¹ Cholak, J., and Story, R. V. *Indus. and Engin. Chem., Analyt. Ed.*, 10 (1938), No. 11, pp. 619-622, figs. 4.

female received, respectively, 156 μ g. of boron daily per male and 1.27 μ g. per female. Good growth, normal development, and reproduction were obtained with this ration. The young born to the mothers appeared normal and were successfully reared. Detailed pathological studies of the tissues of the rats at the end of the 34 weeks showed that they were normal in every respect. The evidence obtained, indicating that boron is not essential in the nutrition of the rat, confirms the findings of Hove et al. (E. S. R., 83, p. 531).

A study of the need for cobalt in dogs on milk diets, D. V. FROST, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 93–100, figs. 3).—Nutritional anemia was produced in pups weaned to a milk diet, and therapy with iron and copper or iron, copper, and cobalt was then instituted. The response of the different dogs to the several treatments indicated that there were cases in which iron and copper sufficed with milk for normal hemoglobin building in dogs. In certain dogs in which the rate of hemoglobin formation seemed unusually slow, the addition of small amounts (0.1–0.5 mg. daily) of cobalt to iron and copper therapy stimulated hematopoiesis. Only one-half of the dogs studied showed a cobalt deficiency, as evidenced by hematopoietic responses to cobalt at a minimum level of 0.1 mg. per day.

The influence of habitat and fertilization on the provitamin A content of vegetables [trans. title], W. SCHUPHAN (*Biochem. Ztschr.*, 305 (1940), No. 4, pp. 323–331, figs. 2).—Data reported for the carotene content, determined by a chromatographic method using a Pulfrich photometer, of 12 varieties of carrots grown in the same region indicate concentrations varying from 6.5 to 14.4 mg. per 100 gm. of the fresh substance (in which dry matter varied from 9.01 to 11.63 percent). The carotene content of the root varied with the portion analyzed. On sectioning the root horizontally into four parts of equal length, the head portion was found to contain 9.5 mg. of carotene per 100 gm. of fresh substance, as compared with but 6.3 mg. for the root tip. Average values of 9.9 and 12.9 mg. per 100 gm. were obtained for the cortex of two varieties and for the xylem 4.7 and 4.1 mg. These variations indicate that adequate sampling would involve the use of sectors ($\frac{1}{4}$ or $\frac{1}{8}$) taken the full length of the root.

A few data summarized are interpreted to indicate that fertilization of the plots influenced the carotene content of vegetables (carrots and tomatoes), and that upon feeding these vegetables to infants the differences in the carotene content were reflected in the level of serum carotene response.

Local action of oils containing vitamin A: Experimental contribution, A. DE RÖTHM (*Arch. Ophthalmol.*, 24 (1940), No. 2, pp. 281–291).—The literature on the effects of local application to the eye of vitamin A-containing oils is reviewed and two series of experiments are reported, the first dealing with keratomalacia in rats resulting from vitamin A deficiency and the second with mechanically induced injury to the corneal epithelium in rabbits. In both cases the effects of locally applied oils containing and not containing vitamin A were observed. The oils, which were administered by eyedropper in doses of 2 microdrops daily, included cod-liver oil furnishing 4.4 International Units of vitamin A daily, halibut liver oil (170 I. U.), carotene in coconut oil (2.8 μ g.), and liquid petrolatum or coconut oil.

In the first series, cod-liver oil and halibut liver oil prevented the outbreak of keratomalacia and cured it unless given in the last stages of the disease, and the effects were noted in both eyes even when only one eye was treated. In one rat in which keratomalacia developed in only one eye, the condition cleared up when the nonaffected eye was treated. Carotene was less effective than the oils containing vitamin A. Liquid petrolatum or coconut oil when dropped in

one eye delayed the outbreak of keratomalacia only in the eye treated and did not prolong life. With the discontinuance of treatment with the vitamin A-containing oils the keratomalacia appeared in both eyes. In the second series the vitamin A-containing oils were no more effective than the vitamin A-free oils in promoting epithelization. It is concluded that oils containing vitamin A have a systemic rather than a local action when applied to the eye, but it is not known whether the vitamin is resorbed by the surface of the eye or reaches the stomach through the nasal duct.

Intestinal absorption of vitamin A in the normal rat, E. L. GRAY, K. MORGABIDGE, and J. D. CAWLEY (*Jour. Nutr.*, 20 (1940), No. 1, pp. 67-74).—Doses of 54,160 U. S. P. units of vitamin A as the distilled ester concentrate from fish-liver oils dissolved in 1 cc. of corn oil were administered by stomach tube to 90-day-old rats averaging 145 gm. in weight and in the post-absorptive condition 16 hr. after the preceding feeding. At stated intervals, from 80 to 398 min. after the administration of the oil, certain animals were etherized and the gastrointestinal contents and the gut walls used for determinations of free vitamin A alcohol, the technic of analytical distillation being followed for the separation of the alcohol.

Of the total vitamin A recovered, the percentage in the alcohol form in the lumen increased from 4.36 at 80 min. to 16.20 at 398 min. and in the gut wall from 59.2 at 220 min. to 81.9 at 398 min. "These data indicate that vitamin A esters behave as do other esters of the fatty acids in the intestinal tract in that they are hydrolyzed by the enzymes present there and, further, that during the height of absorption the vitamin exists in the gut wall chiefly as the alcohol."

The effect of the quantity of basal food intake upon the utilization of vitamin A, K. D. MUELDER and E. KELLY. (Mich. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 13-24).—"The influence of the quantity of basal food intake on vitamin A utilization has been studied by means of carefully controlled triads of rats as measured by the rate of growth and incidence of 'abscessed' areas. For the levels of vitamin A used in this experiment, the caloric intake was responsible for a greater proportion of the gain in weight during a 4-week period than was the unitage of vitamin A administered, the percentage of the gain in weight from caloric intake increasing at each elevation of vitamin intake. When the intake of vitamin A was identical in different groups of animals, the gain in weight was directly related to the quantity of basal diet consumed during the period of observation.

"There was a highly significant reduction in number of abscessed areas by the administration of either 1, 3, or 6 International Units of vitamin A below the number of such areas exhibited by the negative groups, but no statistically significant difference between the levels of vitamin used in this experiment. The quantity of basal food intake showed no statistically significant influence upon incidence of abscessed areas. However, there was some indication of an advantage of unrestricted as compared with restricted food intake at the highest level (6 units) of vitamin A intake."

Vitamin B₁ (thiamine hydrochloride) (Merck) (*Rahway, N. J.: Merck & Co., 1940, rev., pp. [3]-97*).—This revision, dated September 1940, of an earlier bibliography (E. S. R., 83, p. 417) is classified under the headings chemical investigation and description, physiological activity, occurrence, clinical uses (in neurological diseases, in cardiovascular diseases, in gastrointestinal diseases, in infant nutrition, in miscellaneous diseases, and in beriberi), and chemical laboratory methods of assay. The section on clinical uses constitutes the major part of the bibliography.

Physiological activity and clinical use of thiamine hydrochloride (vitamin B₁) (*Rahway, N. J.: Merck & Co., 1940, pp. [3]-46*).—This review, dated

December 1940, is presented under the headings description, history, occurrence, physiological activity (the nervous system, the cardiovascular system, the gastrointestinal system, glandular changes, carbohydrate metabolism, oxidative processes, co-carboxylase, and tissue changes), importance in human nutrition, clinical uses (in beriberi, in neuritis, in cardiovascular disease due to vitamin B₁ deficiency, in certain gastrointestinal disorders, in metabolic disorders, in pregnancy, and in infancy and childhood), dosage and methods of administration, toxicity, and methods of assay. Literature references are assembled as a bibliography of 78 titles.

The distribution of vitamin-B₁ in foods as determined by chemical analysis. M. PYKE (*Jour. Soc. Chem. Indust., Trans.*, 58 (1939), No. 11, pp. 338-340).—The vitamin B₁ content, determined by a rapid thiochrome method and expressed as International Units per 100 gm., is reported for 190 samples of food of diverse nature. For comparison values compiled by Cowgill and by Fixsen and Roscoe are recorded. The generally good agreement between these and the determined values is taken as evidence of the reliability of the chemical method employed. An exception is noted in the case of certain fruits and vegetables for which the determined values are appreciably lower than the quoted values. In the method as outlined complete extraction of the vitamin from the tissues and hydrolysis of the fraction present as the pyrophosphate are accomplished by digestion of the tissue with pepsin followed by takadiastase. The difficulty of measuring the amount of thiochrome by the intensity of its fluorescence was met by the use of the visual method of Wang and Harris (*E. S. R.*, 83, p. 851).

Observations on the distribution of vitamin B₁ in some plant families. M. PYKE (*Biochem. Jour.*, 34 (1940), No. 3, pp. 330-334).—The vitamin B₁ content of various parts of a number of plants was determined by the modified thiochrome procedure noted above. Leaves and tops; roots, bulbs, rhizomes, and tubers; seeds and nuts; and fruits were analyzed. The data in each group are presented for the various plants (designated by common and scientific names) grouped by botanical families. Compiled values of Daniel and Munsell (*E. S. R.*, 73, p. 135), converted into International Units by dividing by 3, are reported for comparison. The two sets of values show fairly good agreement. In commenting on the findings it is pointed out that, in general, vitamin B₁ is highest in seeds and that the concentration in most leaves is about 25 I. U. per 100 gm. regardless of the botanical family. It is suggested tentatively that variation in vitamin B₁ content of fruits of the Rosaceae is due to the degree of ripeness.

The thiochrome method for the estimation of aneurin, with a survey of the aneurin content of wheats. R. G. BOOTH (*Jour. Soc. Chem. Indust., Trans.*, 59 (1940), No. 8, pp. 181-184).—Pyke's procedure, noted above, and involving pepsin-acid and takadiastase digestions, was modified to provide for the preparation of two digests, one of which contained known amounts of thiamin added previous to digestion. The proportion of this added thiamin found by analysis in the fortified digest was taken as a measure of the completeness of digestion and extraction and afforded a factor to apply to the unknown sample to correct for incomplete extraction. A second modification, designed to obviate the incomplete oxidation frequently occurring upon adding the reagents premixed, involved addition of the reagents (methyl alcohol, sodium hydroxide, and potassium ferricyanide) in consecutive order with stirring by a stream of nitrogen. The third modification involved the use of the photoelectric cell and a filter in lieu of visual matching to give closer agreement between the replicates and a greater over-all accuracy.

This modified procedure, described in detail, was applied to the analysis of 78 commercial wheats, 33 of which were English, and to 10 samples of special wheats representing a number of species and various soils and climates. The data, tabulated together with information concerning origin, variety, etc., showed a range of from 0.54 to 2.60 International Units per gram, with an average of 1.25 I. U. for the commercial wheats other than durum, with the latter ranging from 1.65 to 3.33 (5 samples) and averaging 2.37 I. U. per gram. The thiamin content appeared to bear no consistent relationship to species, except in the case of *Triticum durum*, or to fertilizer treatment, soil, climatic conditions, or growing period. Samples of a number of wheats stored in bottles in the laboratory for 10 yr. gave values coming within the range for the commercial wheats, suggesting that there had been little loss of thiamin in storage. Little or no cocarboxylase or protein-bound thiamin was found in wheat.

A test proposed to measure vitamin B₁ saturation in humans, H. POLLACK, H. DOLGER, M. ELLENBERG, and S. COHEN (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 98-100, figs. 3).—The test described in this preliminary report consists in injecting the subject intramuscularly in the fasting state with 1 mg. of thiamin hydrochloride, collecting the urine for a 4-hr. period following the injection, and determining its vitamin B₁ activity by the yeast fermentation method of Schultz et al. (*E. S. R.*, 79, p. 11). A scatter diagram of the results obtained with 349 unselected patients indicates that an excretion of 180% or more in the 4-hr. period represents an average normal value. In similar tests on 35 normal healthy students, instructors, and physicians the values ranged higher, and in 37 patients with gastrointestinal diseases and 11 with cardiac failure the values were lower. A group of 132 patients with diabetes mellitus all gave values closely paralleling those of the large unselected group of patients.

Nicotinic acid (*Rahway, N. J.: Merck & Co., 1940, pp. [3]+142*).—This annotated bibliography is classified under the general headings of chemical investigation and description, physiological activity, occurrence, clinical user, toxicity, and methods of assay.

Presence of a hitherto unrecognized nicotinic acid derivative in human urine, V. A. NAJJAR and R. W. WOOD (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 386-390, figs. 2).—In application of the procedure of Hennessy and Cerecedo (*E. S. R.*, 82, p. 588) in tests for thiamin in urine, the KCl eluate of urine upon treatment with alkali was found to yield a small amount of a substance soluble in butyl alcohol and giving a bluish fluorescence with ultra-violet light. In an attempt to identify the substance, the fluorescence of 27 pyridine derivatives was studied. Although a number of these compounds showed fluorescence, it was unlike that of the unknown except in the case of the diphosphopyridine nucleotide, the fluorescent spectrum of which is reproduced in the present article, together with fluorescent spectra of the butyl alcohol extract of alkali-treated eluates of normal urine and urine after nicotinic acid administration. The two latter spectra were alike but differed from the former one. This indicated that the substance present in normal urine in small amount is identical with that obtained in larger amount after ingestion of nicotinic acid, but that the unknown substance is not identical with the diphosphopyridine nucleotide. A number of observations as to the stability and differential solubility of the unknown substance are presented, and the procedure for detecting it and measuring it quantitatively in the urine is given in detail. It is suggested that the measurement of the unknown substance might prove of value in detecting states of nicotinic acid deficiency in man.

Riboflavin (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+173*).—This extensive annotated bibliography, published under date of January 1941, is classified under the headings chemical investigation and description, occurrence, physiological activity (growth, reproduction, endocrine glands, the skin, the eye, the nervous system, human physiological effects, reviews, and miscellaneous effects), clinical uses (in cheilosis, in diseases of the eye, in pellagra and associated deficiencies, and in miscellaneous diseases), toxicity, and methods of assay (chemical methods and biological methods).

Physiologic activity and clinical use of riboflavin (6,7-dimethyl-9-[1'-d-ribityl]isoalloxazine) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+44*).—This review (dated April 1941), superseding an earlier publication (E. S. R., 83, p. 421), is presented under the headings of chemical and physical properties, history, occurrence, nutritional requirements, physiologic activity (storage and excretion, biologic oxidation, effects on growth, effects on the eye, effects on the skin, effects on the nervous system, and effects on reproduction), clinical uses (in ariboflavinosis and in miscellaneous conditions), dose and methods of administration, toxicity, and methods of assay. References to the literature are assembled as a bibliography of 114 titles.

Vitamin B₆ (pyridoxine) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+64*).—This annotated bibliography (dated February 1941), superseding an earlier one (E. S. R., 83, p. 422), is classified under the headings of chemical investigation and description, physiological activity (in the rat, in the chick, in the dog, in growth of bacteria and yeast, and miscellaneous effects), occurrence, clinical uses, toxicity, and methods of assay.

Action and toxicity of vitamin B₆ hydrochloride, C. G. WEIGAND, C. R. ECKLER, and K. K. CHEN (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 147-151, fig. 1).—Vitamin B₆HCl has been found to be easily soluble in water and to have a pH of 2.44 in 1-percent aqueous solution. No irritation was produced by the intramuscular injection into rabbits of doses of 0.5 cc. of a 1-percent solution of the vitamin, but considerable congestion resulted from the intracutaneous injections of doses of 0.1 cc. of the same solution.

A basal diet described for the biological assay of vitamin B₆ consists of sucrose 67 percent, vitamin-free casein 20, McCollum salt mixture No. 185 4, Crisco 3, liver filtrate free from vitamin B₆ 2, cod-liver oil 2, and agar 2 percent, supplemented with daily doses of 20 γ each of thiamin chloride and riboflavin. When this diet is fed to rats from weaning at the age of 21-23 days, acrodynia and inhibition of growth are said to occur in from 6 to 8 weeks, at which time the material to be tested is fed in graded doses. In a group of 60 rats a dose of from 40 γ to 60 γ cured acrodynia in a large majority of the animals within 14 days, and brought about a marked increase in weight. In mice the median lethal dose of vitamin B₆HCl was established at 545.3 ± 42.9 mg. per kilogram and in rats at 657.5 ± 18.3 mg. per kilogram. Among 12 young male adults no ill effects were observed when vitamin B₆HCl was given either by mouth or by intravenous injection in doses of from 100 to 200 mg. Pain, lasting in some cases as long as 2 hr., followed the intramuscular injection.

The rôle of the unsaturated fatty acids in the acrodynia (vitamin B₆ deficiency) of the albino rat, P. GROSS (*Jour. Invest. Dermatol.*, 3 (1940), No. 6, pp. 505-520, figs. 6).—The basal diet used in this study consisted of sucrose 76, casein (Labco) 20, and Osborne and Mendel salt mixture 4 parts, with daily supplements of riboflavin 20-50 μ g., thiamin chloride 10-20 μ g., choline 1 mg., vitamin A 10 μ g., and vitamin D 5 μ g. dissolved in propylene alcohol. The most characteristic skin lesions developing on this diet, deficient in vitamin B₆ and filtrate factor, are described as "crusting of the mouth, crusting of the eyelids and spec-

*acled eye condition, scaling and crusting of the tail, thickening of the ears and crusting in the more advanced stage; scaling, oozing, crusting, and swelling of the fore and hind paws and legs. These occurred with sufficient regularity. In addition, denudation, especially of the face and neck, changes of the fur including rusting, and hemorrhagic lesions and paralysis of the extremities were observed."

When the diet was further supplemented with vitamin B₆ (40 µg.) and wheat-germ oil (4 drops), none of the animals developed thickening of the ears or the severe condition of the paws and legs responsible for the name acrodynia, but crusting of the mouth, spectacle eye condition, and sculiness of the tail occurred with sufficient regularity to indicate that these lesions are the result of deficiency in the filtrate factor, while swelling and crusting of the ears and dermatitis of the paws are characteristic of deficiency of vitamin B₆. Severe crusting and ulcerations at the root of the tail are also considered signs of B₆ deficiency, and denudation of the face, neck, and areas of the trunk signs of filtrate factor deficiency.

In a group receiving the basal diet supplemented with vitamin B₆ without fatty acids symptoms typical of vitamin B₆ deficiency developed, indicating, as previously shown by Birch (E. S. R., 80, p. 426), that the cutaneous lesions of vitamin B₆ deficiency and fat deficiency are identical and that for their prevention and cure both vitamin B₆ and unsaturated fatty acids are essential. A longer survival period on diets lacking in vitamin B₆ than on diets lacking in unsaturated fatty acids may indicate that vitamin B₆ but not linoleic acid may be synthesized by micro-organisms in the intestinal tract.

Pantothenic acid (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+50*).—This annotated bibliography, dated February 1941, covers the topics chemical investigation and description, physiological activity (in the chick, in the rat, in the pig, in bacterial and yeast growth, and miscellaneous effects), occurrence, clinical uses, toxicity, and methods of assay.

Physiological activity and experimental clinical use of pantothenic acid (calcium pantothenate dextrorotatory) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+23*).—This review, dated March 1941, is classified under the headings chemical and physical properties, history, occurrence, physiological activity (in the chick, in the rat, in growth of bacteria and yeast, and miscellaneous effects), clinical uses, toxicity, and methods of assay. The literature references are assembled as a bibliography of 73 titles.

Pantothenic acid diphosphate, D. W. WOOLLEY (*Jour. Biol. Chem., 134 (1940), No. 1, pp. 461-462*).—Data are summarized briefly indicating that pantothenic acid diphosphate, in common with other esters of pantothenic acid, is biologically inactive.

The anti gray hair vitamin, a new factor in the vitamin B complex, G. LUNDE and H. KRINGSTAD (*Jour. Nutr., 19 (1940), No. 4, pp. 321-332, figs. 7*).—This paper, given as an address, deals with the growth-promoting filtrate factor B_w (E. S. R., 84 p. 282) and the anti-gray hair factor provisionally designated by the authors as B_v (E. S. R., 82, p. 853). Certain of the earlier findings are presented. In addition it is pointed out that the filtrate growth factor B_w not precipitated by phosphotungstic acid or mercuric chloride, that it is soluble in phenol and almost quantitatively dissolved in an acetone-water solution, and that it is unstable toward heat as applied by autoclaving for 8 hr. at 120° C., but only partially destroyed by heating for 3 hr. at 100°. It is noted briefly that new experiments, not reported here, show that a substance extracted with ether from an acidified liver extract promotes growth when fed to rats on a B_w-free diet. It is considered probable that this substance is a new "filtrate" factor distinct from B_w, since the latter is not soluble in ether.

The amount of factor B in certain foodstuffs was determined by a rat-growth procedure in which rats that had ceased to grow on the basal diet, devoid of B but supplied with the other B vitamins, were given test quantities of the food in question. The amount of factor B necessary to produce an average increase in weight of 7 gm. per week was taken as the rat-growth unit of this factor. Tabulated results of the bio-assays indicate that liver and yeast, containing, respectively, 3-6 and 4-6 units per gram, were the best sources of factor B. Wheat germ, corn, and other cereals rated as fair.

B, the anti-gray hair factor, was likewise found present in liver and yeast in large amounts. This factor is soluble in phenol, is not precipitated by phosphotungstic acid, and is completely destroyed in yeast by heating for 3 hr. at 100°. It is noted that the anti-gray hair vitamin B was shown to be necessary for the development of the pelt of silver foxes.

Co-existence of oxidizing and protective mechanisms for vitamin C in plant tissues, K. V. GIRI and P. V. KRISHNAMURTHY (*Nature [London]*, 146 (1940), No. 3690, p. 99).—A substance in plant tissue capable of protecting the vitamin C present from oxidation by ascorbic acid oxidase was discovered. This protective substance was found to exist, together with the ascorbic acid oxidase, in *Cucumis sativus*, *Cucurbita maxima*, and *Luffa acutangula*. Separation of the two factors was effected by treatment of the expressed juice of the vegetables with acetone. The enzyme was found in the precipitate, which could be dispersed in water, while the protective factor was left in the solution from which the acetone was removed by evaporation. Further work on the isolation, purification, and nature of the protective factor is reported as in progress.

Vitamin C content of winter fruits and vegetables, J. E. RICHARDSON and H. L. MAYFIELD (*Montana Sta. Bul.* 390 (1941), pp. 16).—Tables are presented to show the vitamin C content and cost per serving of fruits and vegetables when prepared for table use. The values represent only the nonoxidized ascorbic acid extracted from fruits and vegetables, the determination having been made by means of a photoelectric colorimeter, using the method of Bessey (*E. S. R.*, 82, p. 14). The foods tested in the study were purchased on local (Montana) markets, but only a few were locally grown, most of the fruits and vegetables coming from the South and the canned, dried, or frozen products being commercial packs selected from standard brands. Cost computations were based on prices current in Montana during the winter of 1940-41.

Table 1 gives brief descriptive notes concerning the foods, the initial price, the amount and weight of one serving, the average vitamin C per gram and per serving, the cost per serving, and the vitamin C per 1 ct. A second table arranged for ready reference gives figures for average vitamin C and cost per serving of fruits and vegetables classified as excellent sources (40-100 mg. per serving), very good (20-40 mg.), good (10-20 mg.), fair (5-10 mg.), and poor sources (0-5 mg. per serving).

It is pointed out that, among the fruits, oranges and grapefruit appear to be the best sources of vitamin C and at the same time the most economical; that only about two-thirds of the vitamin C of an orange goes into the extracted juice, the rest being left in the fibers and tissues; that canned citrus juices are economical if purchased in large cans; that 2 cups of commercially canned tomato juice are required to furnish as much vitamin C as one orange; and that the vitamin C content of canned citrus or tomato juice does not decrease during 48 hr. of storage in the opened can in the refrigerator. Among the vegetables, cooked fresh broccoli, fresh brussels sprouts, and stored rutabagas are exceedingly high in vitamin C content; other members of the cabbage family and canned tomatoes are good sources; but many vegetables are only fair or

poor sources of the vitamin, although many of these because of low cost and use in large quantities deserve special attention.

The effect of reduced evaporation on vitamin content of fresh vegetables in refrigerated storage, R. S. HARRIS, H. B. WISSMANN, and D. GREENLIE (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 8, pp. 838-843, fig. 1).—Two types of domestic electric refrigerators of similar compartment size but of different construction were used for the storage of the vegetables. Convection currents and a relative humidity less than 65 percent were maintained in the one box, while slow air movement and a relative humidity of about 98 percent were maintained in the other. Freshly picked lettuce, spinach, parsley, snap beans, shelled lima beans, and shelled peas were stored at a temperature of about 41° F. in each of the boxes for intervals varying from 1 to 7 days, weights before and after storage giving indication of the moisture losses, and vitamin C determinations calculated to the original weight of the sample giving an indication of the vitamin C loss. An extensive series of tests involving about 537 determinations indicated that there were variations between vegetables and between different samples of the same vegetable, but that the maintenance of vitamin C in fresh green vegetables was considerably improved by storage at high humidity and low air movement. The rate of destruction of the vitamin in the six vegetables stored at an average humidity slightly less than 65 percent averaged about 64 percent greater than in corresponding samples stored under conditions of low air movement and an average humidity of about 98 percent. These results were confirmed by biological and photometric measurements, which indicated that vitamin A and thiamin, as well as ascorbic acid, were better preserved when vegetables were stored in more humid atmospheres.

Studies on asparagus.—I, Ascorbic acid [trans. title], J. WOLF (*Gartenbauwissenschaft*, 15 (1940), No. 1, pp. 109-117, figs. 2).—Ascorbic acid, determined by indophenol titration of an extract prepared by grinding the coarsely cut asparagus with fine sand and sufficient metaphosphoric acid to constitute about 3.3 percent of the suspension, was determined in various sections of the shoots of two varieties designated as white and blue. Values for the several samples of white asparagus varied from 56 to 67.4 mg. percent, from 23 to 24.6, and from 15.6 to 17.9 mg. percent for the tip (1 cm.), middle (4 cm.), and end (remaining 3-5 cm.) sections, respectively; corresponding values for the blue asparagus were from 86 to 90, from 28.6 to 32.3, and from 16.6 to 17.9 mg. percent. When other samples representing 11-cm. lengths of middle section were peeled and the peel and inner stalk were analyzed separately, values of 21.7 and 23.0 mg. percent were obtained for the inner stalk of white asparagus (2 samples) and 25.7 and 26.8 for the peel. Values in the blue asparagus (2 samples) were 27.1 and 27.0 for the inner stalk and 41.4 and 40.4 for the peel. It was apparent from these analyses that the ascorbic acid is not uniformly distributed in the asparagus stalk, and that the peel in the white and blue varieties, respectively, contained about 18 and 50 percent more vitamin C than the inner stalk. Green epigeous stalks of these same varieties of asparagus were found to be richer in vitamin C than the previously analyzed underground shoots. For the green samples values from 116 to 127.5, from 50.9 to 52.7, and from 18.0 to 23.9 mg. percent were obtained for the tip, middle, and end sections, respectively. Samples analyzed after storage for several weeks at -0.5° to 0° C. were found to have lost but little ascorbic acid in the middle and end sections, although the losses from the tip, which constituted a relatively small proportion of the stalk, were rapid. Likewise there were no significant losses detected upon storage for 48 or 24 hr. at temperatures of 13.5° and 18.5°, respectively.

The vitamin C content of potatoes, III-V [trans. title] (*Biochem. Ztschr.*, 304 (1940), No. 5, pp. 340-345; 305 (1940), No. 1, pp. 1-3, 4-21).—Three papers are presented.

III. *The ascorbic acid content of frozen and subsequently thawed potatoes*, A. Schuenert and J. Reschke.—Total and reduced ascorbic acid were determined in potatoes held until February under normal storage conditions and in others that were frozen and analyzed immediately after thawing and again after 5 days' storage. The tabulated results indicate that freezing and storage in the frozen condition caused little decrease in ascorbic acid. Upon thawing, however, there occurred a marked decrease (40-50 percent) in reduced ascorbic acid, accompanied by an increase in dehydro- and in irreversibly oxidized ascorbic acid. These changes became more pronounced with storage in the thawed state. Normally stored potatoes cooked by steaming showed little loss of vitamin C due to cooking and had a content of about 13.5 mg. percent of total ascorbic acid (determined after treatment with mercuric acetate and H_2S). The thawed potatoes after steaming contained but 8.2 mg. percent of total ascorbic acid, this figure being still further reduced to 3.9 mg. percent when the potatoes were boiled after peeling.

IV. *The influence of various fertilizer treatments*, A. Scheunert, J. Reschke, and E. Kohlemann.—Seven lots of potatoes were analyzed for vitamin C content, both in the raw and cooked (steamed) state. The variations between samples in any one lot were greater than variations due to origin or to fertilizer treatment (unfertilized, manure, N-P-K, and N-P). Lots analyzed in February were slightly higher in ascorbic acid than those stored longer, raw samples in the two February 1937 lots averaging 13.6 and 13.8 mg. per 100 gm., respectively, while the averages for the five lots analyzed in April 1937 ranged from 9.7 to 11.5 mg.; the cooked samples averaged 10.8 and 11.4 mg. per 100 gm. in February and 8.1-10.0 mg. in April. It is concluded that differences in origin and fertilizer treatment have little effect, and that potatoes stored until the early spring months still have significant value as a source of vitamin C.

V. *Average vitamin C content of German potatoes from autumn to June*, A. Scheunert, J. Reschke, and E. Kohlemann.—Samples from the 1936 harvest representing three varieties, Erdgold, Edelragis, and Ackersegen, each from six different regions, were analyzed for vitamin C content by the dichlorophenolindophenol titration method, these results being checked by bio-assays with guinea pigs. The vitamin C content of individual tubers varied widely within a given variety. For comparative purposes, therefore, average values were used, these being based for any given lot on analyses of representative samples of the steamed potatoes. Steaming was considered the most satisfactory method of cooking from the standpoint of vitamin preservation. Shortly after harvest at the end of October or the beginning of November the vitamin C content of the several varieties of the potatoes in the steamed condition varied from 13.1 to 25.0 mg. percent, averaging about 17.3 mg. percent. By the middle or the end of January the values ranged from 8.9 to 15.7, averaging 11.4, and by the end of April they ranged from 5.9 to 8.4, averaging 7.2 mg. percent.

The data were interpreted as indicating no definite superiority in vitamin C content attributable to variety or place of origin. Any differences observed with regard to these factors at the beginning of the study tended to disappear as the storage period progressed. On the basis of the present studies and others that are cited, it is suggested that the vitamin C content of potatoes steamed or cooked in their skins would be represented by the following values as the storage season progressed: October, 18 mg. percent; November, 15; December, 13; January, 11; February, 10; March, 9; April, 8; and May and June, 7 mg. percent.

The distribution of vitamin C in the potato tuber [trans. title], J. WOLF (*Biochem. Ztschr.*, 305 (1940), No. 4, pp. 294-298).—Values for ascorbic acid content, as determined by 2,6-dichlorophenolindophenol titration of an extract of potato prepared by grinding it up with metaphosphoric acid and filtering in a vacuum, indicated that the concentration of reduced ascorbic acid was lower in the peel than in the pith of the potato. In the Erdgold variety, peel, which constituted about 20 percent of the weight of the tuber, contained from 2.4 to 7.6 mg. of ascorbic acid per 100 gm. (fresh basis), while the remainder contained from 4.2 to 10.2 mg. per 100 gm.; in the Ackersegen variety, the peel (constituting from 15 to 25 percent of the weight of the tuber) contained from 5.6 to 14.6 mg. per 100 gm., while the remainder contained from 7.9 to 19.3 mg. per 100 gm. On the other hand the concentration of total ascorbic acid, representing reduced ascorbic acid plus dehydroascorbic acid as determined by the colorimetric method of Fujita and Ebihara (*E. S. R.*, 79, p. 152), was higher in the peel than in the rest of the potato. Values for the peel in the varieties Erdgold and Ackersegen varied, respectively, from 14.1 to 17.2 and from 10.6 to 19.1 mg. per 100 gm.; while in the remaining portion of the tuber they varied, respectively, from 9.2 to 13.5 and from 8.5 to 19.9 mg. per 100 gm. Considering individual tubers, the peel was from 8 to 46 percent richer in total vitamin C than the remaining portion of the potato. For the Ackersegen variety separate analyses of peel (25 percent of the fresh weight of the tuber), cortical layer (30 percent), and the portion within the vascular bundle ring gave values for reduced ascorbic acid varying from 7.2 to 8.5, from 10.3 to 10.6, and from 7.2 to 10.2 mg. per 100 gm. (fresh basis) for these respective sections; corresponding values for total ascorbic acid were from 8.9 to 13.7, from 10.6 to 12.5, and from 7.9 to 10.5. The samples analyzed had been stored for various periods up to about 3 mo. in a well-ventilated room at about 3.8° C.

A comparison of tomato varieties for vitamin C content, T. M. CURRENCE (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 901-904).—Data were obtained on the ascorbic acid content of field-grown tomatoes from randomized block plantings of varieties in three different seasons. Statistical analysis of these data failed to demonstrate varietal differences. Such differences were found, however, for a crop grown under greenhouse conditions where a large number of replicates were grown and tested. The greenhouse-grown tomatoes were found to contain significantly less vitamin C than field-grown tomatoes, although the relative ratings of the varieties in the two tests were different. Significant differences between weeks were shown for varieties grown in the greenhouse, but these differences did not appear to be associated with the percentage of sunshine.

Factors which affect the vitamin C content of apples, M. S. EHEART (*Virginia Sta. Tech. Bul.* 69 (1941), pp. 16, figs. 2).—Determinations of vitamin C by dichlorophenolindophenol titration were made by a technic described, this representing modifications of the Thornton technic based on the method of Bessey and King. The protocols presented show that the method is accurate for vitamin C determinations in apples, since an average recovery of 98.3 percent was secured. Determinations with and without the use of hydrogen sulfide in 19 varieties gave higher values in the former case, indicating that the reversibly oxidized (dehydro) form of vitamin C occurs in apples. On an average the dehydro form of the vitamin was present to the extent of 18.2 percent of the reduced form. During storage the proportion of the dehydro form decreased.

The vitamin C concentration in the peel was found to be higher than that of the flesh, the ratio of concentrations in these two tissues averaging 4.7 and

varying from 2.5 in Delicious to 10.0 in Red Rome apples. Small apples, however, did not in general show higher concentrations of the vitamin than did large apples. Of 13 varieties studied, only 3, Ben Davis, Arkansas Black, and Stayman Winesap, showed significant correlations between size and vitamin C content.

The 19 different varieties of Virginia-grown apples varied greatly in vitamin C content. Albemarle Pippin contained 8.4 mg. per 100 gm., while the Mother variety contained only 1.5 mg. It is pointed out that two apples of the Albemarle Pippin variety would supply over one-half of the day's need for vitamin C (tentatively 60 mg.) and that two of the Black Twig or Winter Banana variety would supply one-third of the day's need. Most apples, eaten to the extent of two a day, would furnish from one-sixth to one-fourth of the needed amount of vitamin C. Cooking caused appreciable destruction of the vitamin, the losses being greater in applesauce and in apples baked in pies than in fried apples. Amounts retained upon cooking by these several methods, respectively, varied from 63.4 to 15.06, from 66.2 to 8.84, and from 11.03 to 35.44 percent. When the raw apples, cut into eighths, were soaked for 24 hr. in a 2.5-percent salt solution before cooking, the vitamin C losses were reduced, especially in applesauce. Storage losses were significant. On an average (16 varieties) only about 60 percent of the original amount remained after 24 weeks' storage at 37.9° F., while at 35.3° the average retention (14 varieties) after 18 weeks' storage amounted to 69 percent.

Sea-buckthorn, a vitamin C-rich fruit suitable for marmalade [trans. title], C. GRIEBEL and G. HESS (*Ztschr. Untersuch. Lebensmitl.*, 79 (1940), No. 5, pp. 469-471, fig. 1).—The orange-colored berries of the sea-buckthorn (*Hippophae rhamnoides* L.—*Elaeagnaceae*) were analyzed for vitamin C content by an improved iodine method (E. S. R., 82, p. 711). The ripe fruits, gathered in the late autumn, were found to have a vitamin C content of 200 mg. percent. Marmalade prepared by cooking the berries with sugar contained 79 mg. percent of the vitamin a few days after preparation and 72 mg. percent 2½ mo. later.

Variations in ascorbic acid content of grapefruit and oranges from the Rio Grande Valley of Texas, E. METCALFE, P. REHM, and J. WINTERS (*Food Res.*, 5 (1940), No. 3, pp. 233-240).—Oranges and grapefruit obtained from six different growers, two in the eastern, two in the central, and two in the western part of the Rio Grande Valley, were analyzed by the indophenol titration method for their content of ascorbic acid. Six varieties of grapefruit, and six of oranges were analyzed, and variations attributable to variety, region, and season were studied. Six of the growers furnished samples at the beginning of the season (November), five at the middle (February), and four at the end of the season (April). Not all varieties, therefore, were represented at all seasons from all locations.

Averages of all determinations regardless of location or season expressed as milligrams of ascorbic acid per 100 cc. of filtered juice, were for grapefruit varieties, Marsh 36.4, Marsh Pink 32.4, Red Blush 32.7, Marsh Seedless 32.0, Foster Pink 34.3, and Duncan 37.7; and for oranges, navel 41.1, Valencia 42.3, Hamlin 50.0, Joppa 46.9, Pineapple 54.2, and Temple 52.4. When tabulated by varieties to show the effect of season and of location, variations due to these factors were greater than those due to varietal differences. In all varieties there was a definite reduction in ascorbic acid at the end of the season and considerable but inconsistent variation on the basis of location. Samples kept in cold storage for 1 mo. showed no decrease in ascorbic acid. Processing to destroy the Mediterranean fruit fly larvae did not affect the ascorbic acid content.

Vitamin C requirement of the guinea pig, E. E. ECKER and L. PILLEMER (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 262-263).—Determinations of

ascorbic acid in the blood serum of guinea pigs on a stock diet of Purina mixed rabbit chow supplemented with graded doses of ascorbic acid of from 0.5 to 20 mg. daily showed increased values with increased dosage up to 10 mg. The minimum, maximum, and average values for 148 animals on this dosage were 0.83, 1.44, and 1.03 mg. per 100 cc. and for 85 animals on a 20-mg. dosage 0.87, 1.73, and 1.08 mg., respectively. As serum complement in guinea pigs reaches its maximum activity at a level of about 1 mg. of ascorbic acid per 100 cc., it is thought that the vitamin C dosage to maintain normal activity of the blood serum proteins should be at least 10 mg. daily.

Vitamin C studies.—I, The effect of vitamin P (citric) on vitamin C deficient guinea pigs, L. E. DETRICK, M. S. DUNN, W. L. McNAMARA, and M. E. HUBBARD. (Univ. Calif. et al.). (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 7, pp. 684-687, fig. 1).—Various citric (vitamin P) preparations (E. S. R., 77, p. 740) isolated by C. W. Wilson were tested on vitamin C-deficient guinea pigs. None of the preparations decreased the hemorrhagic condition of the scorbutic animals or prolonged their life, and only one had any favorable effect on the physical condition of the animals during the last days of the experiment. It is noted that ulcerous lesions of the stomach appeared in 20 percent of the C-deficient animals tested in November, January, and March but none in the experiments conducted in June.

The error of vitamin D assay by the ash content of bone method, E. A. G. SHERRINGTON (*Quart. Jour. Pharm. and Pharmacol.*, 13 (1940), No. 2, pp. 97-108).—Data by Kon and Henry (E. S. R., 76, p. 681) showing the bone ash response of rats fed varying doses of six butter samples in comparison with the response of animals fed varying doses of the standard vitamin D preparation were used as a basis for statistical study. The present analysis was undertaken to establish whether a linear dosage response relation exists and whether the slopes and variances within and between tests remain constant apart from fluctuations of sampling. Proceeding by an analysis of variance, the author concludes that "the dosage response relation is linear when the response is given as the percentage ash content in bones and that is compared with the log. of the dose. The slope of the linear dosage response reaction is significantly greater for animals receiving the unknown preparation, butter, than for animals receiving the standard preparation. For the same preparation the slopes appear to remain constant from experiment to experiment. The effect of these slope differences on the potency ratios may, however, for practical purposes be neglected, and without any marked loss of accuracy a common slope may be assumed. For a 20-rat experiment the limits of error ($P=0.99$) were found to be 66 and 152 percent."

The determination of vitamin D in food substances containing phosphorus, K. H. COWARD and E. W. KASSNER (*Biochem. Jour.*, 34 (1940), No. 4, pp. 538-541).—Evidence is presented to show that supplements of vitamin D plus phosphate given to rachitic rats on a low-calcium high-phosphorus rachitogenic diet had a multiplicative effect on healing and not an additive one, as judged by the effect of the vitamin D and the phosphate supplements fed separately. The lower doses of phosphates (60 and 115 mg. K_2HPO_4 in the 10-day period) alone were practically without effect on calcification as judged by the line test, but all doses (60-1,380 mg.) affected the calcification brought about by either 5 or 10 units of vitamin D. These findings confirm the conclusions of Bruce and Callow (E. S. R., 73, pp. 569, 570). It is pointed out that in determining the vitamin D content of a food substance containing enough phosphorus in the test dose to alter the Ca:P ratio of the diet, the only practical method would involve extraction of the ether-soluble portion after saponification, and determination of the vitamin D content of the extract.

Biological assay of vitamin D₂.—I, Assay methods at present in use, with particular reference to Olsson's radiographic technique, A. Z. BAKER and M. D. WRIGHT (*Analyst*, 65 (1940), No. 771, pp. 326-335, figs. 2).—The principles of Olsson's radiographic method (E. S. R., 78, p. 236) were used in these tests, which confirmed his finding that the width of the tarsometatarsal distance, measured in radiographs of growing bones, is related to the amount of vitamin D₂ in chick rations. According to the technic outlined, day-old chicks of standard breed kept under standard housing conditions were placed on a basal ration, described as to composition and analysis, for a depletion period of 1 week, after which the test oil or the vitamin standard was added to the basal ration on which the chicks were continued for from 4 to 6 weeks. Groups of 20 birds each were run at four or more levels of the standard and of the test oil, respectively. The tarsometatarsal joints were photographed under definite conditions in an anteroposterior position, and the tarsometatarsal distance was measured on the film by a vernier microscope magnifying 5 diameters. The standard curve (line) was established by plotting the log of the tarsometatarsal distance against the log of the dose. The response of the chicks to the test doses were read against the standard curve obtained with pure vitamin D₂ or with a standard reference cod-liver oil assaying 200 rat units per gram. By use of the log of the tarsometatarsal distance rather than the distance itself, the variability of response to different doses was equalized. The error of the Olsson method estimated in a number of assays was found to be approximately the same as that of the A. O. A. C. method conducted in the same laboratory.

Vitamin D₂ and D₃ and A. T. 10 in congenital thyroid and parathyroid deficiency, H. P. HEDSWORTH and M. MAIZELS (*Lancet* [London], 1940, I, No. 21, pp. 959, 960).—A case of congenital thyroid and parathyroid deficiency associated with tetany and epilepsy is described, and the nature of treatment and the results are noted. As indicated by the specificity of the treatments, the tetany was independent of thyroid deficiency. The boy, observed continuously since 1934, was found to present a very constant response in that epileptic fits and tetany disappeared when blood calcium rose above 7 mg., but reappeared whenever the blood calcium fell below this level. In control of the parathyroid deficiency vitamin D₂ (calciferol) in oil was administered orally in the amount of 500,000 units weekly. For long test periods of about 10 and 12 mo. this treatment served to keep the blood calcium at an average of 8.0 and 8.4 mg. per 100 cc., respectively. A German preparation, A. T. 10 (dihydrotachysterol), administered for a 10-mo. period between the two D₂ periods, was effective in controlling the parathyroid deficiency, but was less reliable in its action, permitting fluctuation of the calcium level and achieving effectiveness only in steadily increasing dosage (1-6 cc. a week). Vitamin D₃, administered for a period of 4½ mo., was equivalent to the vitamin D₂. Despite the continued administration of the large dosage of vitamin D₂ and comparable dosages of related substances for nearly 6 yr., no signs of hypervitaminosis D had appeared.

Potency of vitamins D₂ and D₃ in osteomalacia and late rickets, D. C. WILSON (*Lancet* [London], 1940, I, No. 21, pp. 961, 962).—Pure specimens of vitamin D₂ from irradiated ergosterol and of vitamin D₃ from irradiated 7-dehydrocholesterol were compared for their therapeutic effects in 13 pairs of patients with osteomalacia and in 2 pairs with late rickets. The patients were Indians aged from 6 to 70 yr. in the Kangra Valley, Punjab. The specimens were similar to those used in the studies noted above and were administered orally in olive oil in single weekly doses, the same for both members of a pair, of 10,500 or 21,000 International Units. The total amount given over the whole period of treatment varied from 21,000 to 84,000 I. U. "The results, assessed by clinical

estimates of the patient's progress and by the disappearance of carpopedal spasm, of pain in specified sites, and of difficulty in walking, showed the two preparations to be equally effective. For both preparations a dose of 10,500 I. U. of vitamin D weekly caused only slow improvement within a period of 2 weeks, whereas a dose of 21,000 I. U. caused improvement in a week." This finding, together with earlier observations (E. S. R., 67, p. 89) that the use of spaced large doses of cod-liver oil in the treatment of rickets effected a more rapid cure than daily administration, indicated the advantages of spaced weekly doses. No ill effects from the large doses were observed.

The potency of vitamins D₂ and D₃ (*Lancet* [London], 1940, I, No. 21, pp. 969-971).—This editorial review summarizing the findings of a number of studies including the two noted above, concludes that the problem concerning the relative superiority of these two forms of vitamin D cannot be regarded as settled.

The therapy of rickets, E. A. PARK (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 5, pp. 370-379).—This review considers the chemical nature of vitamin D, defines the unit, points to the low potency of most foods, and discusses the various available sources, the relative biologic value of the two main forms of vitamin D (7-dehydrocholesterol and viosterol), and the use of vitamin D for the prevention of rickets and infantile tetany and for the cure of rickets. Pertinent facts are given regarding the relationship of ultraviolet light to rickets, artificial sources of ultraviolet light and how to employ them, and the use of sunlight for protection against rickets. Sections are devoted to the treatment of refractory rickets; induction of rapid healing, considered advisable in cases of so-called thoracic rickets; means of determining whether vitamin D therapy is succeeding; signs of toxicity of vitamin D; and relative cost of the different preparations of vitamin D.

Alpha-tocopherol (vitamin E) (*Rahway, N. J.: Merck & Co., 1940, rev., pp. [3]+138*).—The literature references in this extensive revision under date of October 1940, of an earlier annotated bibliography (E. S. R., 83, p. 423) are classified under the headings chemical investigation and description (including methods of assay), physiological activity (the nervous system, the muscular and neuromuscular systems, reproductive and allied functions, endocrine glands, tumor formation, growth, and miscellaneous effects), occurrence, clinical uses of α -tocopherol (in neurological, neuromuscular, and muscular diseases, in disorders of reproduction and in gynecological diseases, in miscellaneous diseases, and vitamin E in the diet), and reviews.

Physiological activity and experimental clinical use of alpha-tocopherol (vitamin E) (*Rahway, N. J.: Merck & Co., 1940, pp. [3]+27*).—This review, dated November 1940, includes a description of the vitamin, its history, occurrence, physiological activity (concerning reproduction, muscular dystrophy, effects on central nervous system, effects on growth, effects on endocrine glands, and miscellaneous observations), toxicity and pharmacological activity, clinical uses (in abortion, in muscular dystrophy, in neurological diseases, and in miscellaneous conditions), dosage and methods of administration, and methods of chemical assay. Literature references (87 titles) have been assembled as a bibliography.

Occurrence of tremors and incoordination of vitamin E-deficient adult rats, C. G. and J. B. MACKENZIE and E. V. MCCOLLUM (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 95-98, fig. 1).—This paper describes a type of paralysis which developed in four male and two female rats maintained on the authors' highly purified vitamin E-deficient diet (E. S. R., 81, p. 738). The first stage of the paralysis, developing in from 32 to 40 weeks, was manifested by a spreading of the hind legs and a marked lowering of the posterior abdominal wall. The weekly administration to one of the females in this stage of 40 mg. of a vitamin E concentrate possessing antisterility activity in a single

3-mg dose prevented the development of further symptoms. In 45 or 50 weeks the untreated animals showed a second stage of paralysis in which the hind legs became practically useless for walking. Several weeks later the untreated animals, especially the males, developed tremors and incoordination of the forelegs and head, particularly when the animals were moved or stimulated by a shrill noise. In a third stage, developing in the males 10 or 12 weeks after the second stage, the hindquarters were dragged along the floor, with both legs swinging. This stage had not developed in the untreated female by the seventy-third week. Attempts to cure two of the males by the administration of 40 mg. of the vitamin E concentrate weekly, starting after 46 weeks and continuing for 16 and 20 weeks, were unsuccessful, although the progress of the neuromuscular symptoms were arrested and growth was renewed. No effect was secured by doubling the dose.

Vitamin K (*Rahway, N. J.: Merck & Co., [1940], pp. [1]+VII+91*)—This annotated bibliography of 206 references covering the literature of 1939–40 is arranged chronologically.

Vitamin K (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+44*)—In this supplement, dated January 1941, to the above noted bibliography, the annotated references to the literature of 1940 are classified under the headings chemical investigation and description, physiological activity, clinical uses (in surgery, in obstetrics, prothrombin determination, and miscellaneous uses), and methods of assay.

Plasma prothrombin determination, D. H. KAUMPF and J. H. GREENWOOD (*Amer. Jour. Clin. Pathol., 10 (1940), No. 6, pp. 397–407, figs. 7*).—Quick's method was investigated, with the conclusion that 0.25 cc. of the calcium chloride and thromboplastin solutions, respectively, and 0.5 cc. plasma give optimal concentrations, that clotting time varies with the temperature of the reaction, but that 70°–80° F. is sufficiently accurate for clinical purposes. No source of thromboplastin was found superior to dehydrated rabbit brain. It is recommended that normal controls be run at the same time as the test plasma and that prothrombin content be expressed as percentage of normal.

Factors influencing plasma prothrombin in the newborn infant.—III, A study of the vitamin K activity of various naphthohydroquinone derivatives, L. M. HELLMAN, W. T. MOORE, and L. B. SHETTLER (*Bul. Johns Hopkins Hosp., 66 (1940), No. 6, pp. 379–389*).—Infant prothrombin levels at delivery were determined in seven groups of infants whose mothers, during labor, received the various substances tested in equivalent doses of 2,000 Ansbacher units (*E. S. R., 83, p. 12*), which previous experience had shown was approximately the minimal effective dose. The general procedure and the method of determining plasma prothrombin level are noted in the previous study (*E. S. R., 84, p. 569*) from which the values of the control group are taken. Prothrombin levels of mother and child are presented individually and as averages by groups, and in each group of infants the elevation in mean prothrombin level over that of the control group whose mothers had not received such treatment was tested for significance by statistical analysis. From this analysis it was apparent that the small doses (equivalent as to unitage) of 2-methyl-1,4-naphthoquinone, 2-methyl-1,4-naphthohydroquinone dipropionate, and 2-methyl-3-phytyl-1,4-naphthoquinone, when dissolved in oil and given by mouth to mothers during labor, were capable of raising the prothrombin level of the newborn infant. 2-Methyl-1,4-naphthohydroquinone-3-sodium sulfonate, administered intravenously in similar dosage, also possessed significant vitamin K activity; given intramuscularly, however, it was not effective in raising the prothrombin levels of newborn infants. Oral administration of vitamin K concentrate or of the 2-methyl-1,4-naphthoquinone in milk-sugar pills likewise failed to be effective.

Additional observations on the vitamin K activity of quinones, E. FERNHOLZ, H. B. MACPHILLAMY, and S. ANSBACHER (*Amer. Jour. Chem. Soc.*, **62** (1940), No. 6, pp. 1619-1620).—2-Methyl-5,6,7,8-tetrahydro-1,4-naphthoquinone, $\beta,\gamma,5,6,7,8$ -hexahydro vitamin K₁, naphthotocopherol, and its quinoid oxidation product were all prepared by methods noted. The first three were found inactive at levels of 1, 2, and 1 mg., respectively, but the last-named compound was fully active at the 1-mg. level.

The biological activity of the natural K-vitamins and some related compounds [trans. title], H. DAM, J. GLAVIND, and P. KARRER (*Helvetica Chim. Acta*, **23** (1940), No. 2, pp. 224-233).—The preparations were assayed by the method of Dam and Glavind.²³ The protocols presented are summarized and show the following activities in Dam units per gram: Vitamin K₁ (phyloquinone) from alfalfa, 12,000,000; vitamin K₂ from putrefied fish meal, 8,000,000; phylohydroquinone diacetate, 1,000,000; 2-methyl-1,4-naphthoquinone, 25,000,000; 2-methyl-1,4-naphthohydroquinone diacetate, 14,000,000; 2-methyl-1,4-naphthohydroquinone disuccinate, 15,000,000; 2-phytyl-1,4-naphthoquinone, approximately 50,000; 2-oxymethyl-1,4-naphthoquinone acetate, approximately 100,000; 1,4-naphthoquinone, approximately 50,000; 2-methyl-naphthoquinone monoxime, 5,000,000; and 2-methyl-1-oxo-4-aminonaphthalene chlorohydrate, 10,000,000.

Nutritional deficiency of vitamin K in man, H. SCARBOROUGH (*Lancet [London]*, 1940, I, No. 24, pp. 1080-1082).—Eighteen cases of clinical hypovitaminoses (12 diagnosed as scurvy, 4 as beriberi, and 2 as pellagra) gave evidence in each case of one or more additional deficiencies. Deficiency of vitamin A was demonstrated by the dark-adaptation test, of vitamin B₁ by estimation of the vitamin in the blood, of vitamin C by an ascorbic acid saturation test, and of vitamin P by measurement of capillary resistance. Vitamin K deficiency, assessed in terms of the prothrombin time determined by the original method of Quick, and expressed as prothrombin indices, apparently did not exist in any of these cases, since the lowest prothrombin index was 92 percent. This evidence is contrary to that reported by Kark and Lozner (*E. S. R.*, **83**, p. 285) for 4 cases of multiple deficiency of nutritional origin, but it is pointed out that their conclusions were based on determinations of prothrombin made on a series of dilutions of the unknown plasma, and that if their results were calculated as prothrombin indices, values from 77 to 97 percent, indicating but mild vitamin K deficiency, would be obtained. These results indicate the importance of considering the methods of determining plasma prothrombin. Since multiple deficiencies were present in the 18 cases reported here, as well as in the 4 of Kark and Lozner, the method of Kark and Lozner is deemed probably superior to the Quick method.

A new type of vitamin K-deficient diets, S. ANSBACHER (*Soc. Expt. Biol. and Med. Proc.*, **44** (1940), No. 1, pp. 248-250).—A diet that obviates the difficulties arising from K-vitamin synthesis is described. This diet, K-7, consists of a grain mixture (wheat middlings 25 and yellow corn 58) heated for 1 week at 120° C. to destroy any vitamin K, washed casein 12, salt mixture 2, calcium carbonate 1, and cod-liver oil 2. Baby chicks on this diet grew very slightly, had an increased clotting time, showed typical K avitaminosis in from 4 to 8 days, and died within approximately 2 weeks. For assays with chicks weighing about 70 gm., it is suggested that they be started on a vitamin K-low ration, such as one described earlier (*E. S. R.*, **83**, p. 12), and fed ration K-7 only after attaining the desired weight. Experiments showed ration K-7 to be deficient not only in vitamin K₁ but also in pantothenic acid and some other

²³ *Biochem. Jour.*, **32** (1938), No. 6, pp. 1018-1023, fig. 1.

as yet unknown factor or group of factors. Preliminary results indicated also that the ration could be used as a basal diet for rats in studies of the anti-achromotrichia factor.

A substitute for bile salts for administration with substances possessing vitamin K activity, E. LOZINSKI and R. GOTTLIEB (*Jour. Biol. Chem.*, 133 (1940), No. 2, p. 635).—Dioctyl sodium sulfosuccinate, a compound which, like bile salts, exerts a nonspecific high surface activity, was administered with 2-methyl-1,4-naphthoquinone to three cases with prolonged prothrombin times. In each case the prothrombin time decreased, whereas such decrease was not observed in similar cases receiving only the 2-methyl-1,4-naphthoquinone. "Further consideration arises as to what role such surface-active substances may play in fat transport generally."

Synthetic vitamin K in treatment of hypoprothrombinaemia, R. KARK and A. W. SOUTER (*Lancet* [London], 1940, I, No. 26, pp. 1149-1153, figs. 5).—A water-soluble derivative of 2-methyl-1,4-naphthoquinone, the synthesis of which is credited to Moore and Kirchmeyer, and which is considered on a theoretical basis to be the sodium salt of the 3-sulfonic acid of 2-methyl-1,4-naphthoquinone (or naphthohydroquinone), was administered parenterally in the therapy of 18 patients with hypoprothrombinemia. In 9 of these from 1 to 6 cc. of the aqueous solution equivalent to from 1 to 6 mg. of 2-methyl-1,4-naphthoquinone effected rapid restoration of the lowered blood prothrombin concentration to normal, and in 3 with hemorrhage the bleeding was satisfactorily controlled a few hours after intravenous or intramuscular injection of the material. On the other hand, 12 patients with hypoprothrombinemia associated with parenchymatous liver disease did not respond to treatment with the test compound or with natural vitamin K from alfalfa supplemented in some cases by large doses of 2-methyl-1,4-naphthoquinone or whole liver by mouth.

Treatment of hypoprothrombinemia haemorrhagica neonatorum (hemorrhagic disease of the newborn) with vitamin K, H. G. PONCHER and K. KATO. (Univ. Ill. et al.). (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 1, pp. 14-17, fig. 1).—This study reports the successful treatment of 22 infants with hypoprothrombinemia hemorrhagica neonatorum. Three synthetic preparations of vitamin K were employed—(1) 2-methyl-1,4-naphthoquinone, (2) 2-methyl-4-aminonaphthol hydrochloride, and (3) an aqueous solution of 2-methyl-1,4-naphthoquinone with sodium bisulfite. These administered orally, intramuscularly, and subcutaneously in the order named caused prompt and permanent clinical improvement.

Use of illuminating gas to check metabolism apparatus, I. BUNNELL and F. R. GRIFFITH, JR. (*Soc. Exptl. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 509-514, figs. 2).—Ordinary illuminating gas for checking the operation of metabolism apparatus for use with small animals was found more satisfactory than alcohol, ether, or acetone, since the combustion of the gas proceeded evenly for metabolically significant periods at rates comparable to the respiratory metabolism of the rat. A simple, easily operated apparatus giving accurate results was devised for measuring and burning the small volume of gas required. This apparatus is illustrated by diagram and described. The procedure for conducting the test and the control determinations is given in detail, and results of a few determinations are tabulated.

The care of a small rat colony, R. J. MAIN (*St. Louis, Mo.: C. V. Mosby Co.*, 1939, pp. 101, figs. 12).—This manual, written for the benefit of those unfamiliar with rats and not technically trained in the matter of their care, presents from the author's experiences simple directions for the establishment of a small colony. Adequate working details are given, and attention is called to many difficulties that may be encountered. Consideration is given to the

selection of rooms, especially for their adequacy as to size and temperature regulation; equipment; cleaning and painting; rearing, mating, and growth of the animals; feeding; disease and vermin; the daily routine; the expense item; and notes on the assay of vitamin D milk. The appendix lists articles and books dealing with rats and their care, and a number of books on feeds and feeding; and, as a help to the beginner, gives the addresses of a few firms from whom cages, equipment, and feeds may be obtained.

TEXTILES AND CLOTHING

Wool scouring tests in Utah, A. C. ESPLIN, R. W. PHILLIPS, and M. A. MADSEN (*Utah Sta. Bul. 298 (1941), pp. 24, figs. 4*).—The tests reported were made on 115 whole fleece samples obtained at shearing corrals, 91 composite samples, largely drawn from herds at shearing time, and side samples from 1,083 sheep.

Average yields of clean wool from whole fleece samples of the respective grades were for fine 32.94, half blood 38.24, three-eighths blood 42.67, and quarter blood 46.59 percent. The average yields of clean wool from composite samples of the various grades were fine 34.82, half blood 40.26, and three-eighths blood 43.84 percent. Seven tests of duplicate composite samples, scoured in different laboratories, showed differences ranging from 0.2 to 1.9 percent and averaging 0.73 percent. Wide variations were found in the yield of clean wool within grades in the herds tested, both in tests of whole fleeces and of composite samples.

Yields of clean wool from individual sheep in the college flock, as indicated by tests of side samples, averaged for Rambouillet 44.81, Corriedale 54.21, Hampshire 53.30, and Southdown 45.74 percent. Average yields of clean wool in the branch college flock and in the herd of a cooperator, as indicated by scouring tests of side samples, were 42.47 and 36.02 percent. Tests of individual side samples from a group of grade Rambouillet experimental lambs showed that lambs farm-fed during the winter gave higher yields of clean wool than those wintered on the range. Average yields of clean wool from lambs producing fine wool were 53.41 farm-fed and 45.30 percent range, and for lambs producing half blood wool 54.17 and 43.62 percent, respectively. Wide variations observed in yields of clean wool from individual sheep in all groups studied indicated the possibilities of considerable increase in the yields of clean wool through breeding and selection.

Recommendations are that scouring tests of carefully selected composite samples should be used as a basis for estimating the yield of clean wool in determining the price of the grease wool. These tests, generally applicable to the range area and inexpensive, could be carried out in a central laboratory or in warehouses maintained by growers. Whole fleece samples might also be used if adequate scouring facilities are available. Scouring tests of individual side samples should be used as one measure of the merit of individual sheep in the flocks of breeders that are producing rams for use in range herds.

HOME MANAGEMENT AND EQUIPMENT

How Maine families finance higher education (*Maine Sta. Bul. 400 (1940), pp. 219-221*).—From analysis of data secured in 1938 by P. S. Greene, factual information is summarized on expenditures, including tuition, fees, and total maintenance during the school year of university students selected mainly from unbroken families and at various income levels. In addition to total expendi-

tures an analysis is included of the expenditures at different income levels, extent of self-help, relation of expenditures and position in the family with respect to other children, and with relative expenditures of men and women students.

[Household equipment studies by the Maine Station] (*Maine Sta. Bul. 400 (1940), pp. 221-227*).—This progress report (E. S. R., 83, p. 430) summarizes an extension of studies by M. M. Monroe and P. S. Greene on the effect of the method of heat application and accompanying oven conditions upon flavor and texture of baked foods and the performance of wood ranges heated by distillate burners and an evaluation of factors which affect their performance.

MISCELLANEOUS

Fifty-first Annual Report [of Arizona Station], 1940, P. S. BURGESS and R. S. HAWKINS (*Arizona Sta. Rpt. 1940, pp. 112, figs. 12*).¹²

Annual Report [of Florida Station], 1940, W. NEWELL ET AL. (*Florida Sta. Rpt. 1940, pp. 213-IX, figs. 26*).¹²

Report of progress [of Maine Station] for year ending June 30, 1940, [F. GRIFFEE ET AL.] (*Maine Sta. Bul. 400 (1940), pp. [7]+185-294, figs. 6*).¹²

Fifty-third Annual Report of the [Michigan Station], 1940, V. R. GARDNER (*Michigan Sta. Rpt. 1940, pp. 123-137*).—This consists mainly of lists of publications and projects.

Forty-seventh Annual Report [of Minnesota Station], W. C. COFFEY (*Minnesota Sta. Rpt. 1940, pp. 104*).—In addition to articles noted previously or referred to elsewhere in this issue, abstracts are given of the following: The Literature of Wood and Wood Technology, by A. J. Bailey (p. 20); The Influence of Dry Milk Solids as a Bread Ingredient Upon Bread Consumption, by C. H. Bailey (p. 30); and Government Aid for Low-Income Farm Families, by L. Nelson (p. 55).

Farm and Home Science, [June 1941] (Farm and Home Sci. [Utah Sta.], 2 (1941), No. 2, pp. 12, figs. 17).—In addition to articles noted elsewhere in this issue, this number contains the following: Land-Use Planning Tries To Coordinate State Agricultural Program (pp. 1, 10); Two New Laboratories Developed by the Animal Husbandry Department, by R. W. Phillips (p. 2); Good Butterfat Production Obtained Through Feeding of Roughages, by G. B. Caine (p. 4); Regional Salinity Laboratory Cooperates With Experiment Stations in Solving Alkali Problems, by R. H. Walker (pp. 5, 10); and Home Landscaping Enriches Rural Living, by L. S. Morris (p. 12).

Numerical list of current publications of the United States Department of Agriculture, F. L. ZIMMERMAN and P. R. READ (*U. S. Dept. Agr., Misc. Pub. 450 (1941), pp. V+929*).—This list discussed editorially on page 578.

¹² The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Alabama College and Station.—Dr. J. W. Tidmore, head of the department of agronomy and soils and assistant director of the station, was killed in an automobile accident on July 24. Born in Alabama on December 19, 1898, he was graduated at the institution in 1919, receiving the M. S. degree there in 1924 and the Ph. D. degree from the University of California in 1929. His service in Alabama began in 1924 as assistant soil chemist. He had worked especially on problems of soil fertility and plant nutrition.

Arkansas University and Station.—The resignation is noted of Deane G. Carter, head of the department of agricultural engineering, and the appointment in his stead of E. L. Barger. Dr. Horton M. Laude has been appointed assistant professor of agronomy; E. D. Marshall, instructor in forestry and assistant forester; and Arlon G. Hazen, instructor in agricultural engineering and assistant agricultural engineer.

Colorado Station.—Anna M. Lute, seed analyst, retired September 1.

Connecticut University and Stations.—A school of agriculture for 2-year training along vocational lines has been organized in the College of Agriculture. Wilfred B. Young, associate professor of animal husbandry and extension animal husbandman, has been appointed director.

The annual field day of the State Station was held at Mount Carmel Farm on August 20. Special prominence was given to work under way with the Japanese beetle and other insect pests, plant diseases, and new fungicides and the breeding of corn, strawberries, summer squash, tomato, and pepper. The principal address was given by Dean E. G. Woodward of the College of Agriculture on Farming as a Way of Life.

Louisiana Station.—W. G. Taggart, assistant director, has been appointed director vice Dr. C. T. Dowell, who has been designated professor of agronomy.

Maryland University and Station.—Three reserve officers, Dr. H. G. Shirk, assistant plant physiologist, James M. Gwin, associate professor and associate in poultry production and marketing, and Dr. H. L. Stier, assistant professor of horticulture and assistant horticulturist, have been called for active service.

Massachusetts College and Station.—M. E. Ensminger, assistant professor of animal husbandry, has been appointed head of the department of animal husbandry in the Washington College and Station. Dr. C. R. Fellers has been designated as head of the department of horticultural manufactures in the station, and Dr. William B. Esselen, Jr., has been appointed assistant research professor. Floyd A. Johnson has succeeded Mabelle Booth Tucker as laboratory assistant in agricultural economics.

Michigan College and Station.—The budget for 1941 and 1942 has been set at \$4,571,977.94 as compared with \$4,246,277 for the previous biennium.

Dr. E. H. Newcomer has resigned as research assistant in cytogenetics to accept a position in the department of botany in the University of North Carolina and has been succeeded by Dr. Carl P. Swanson. Dr. C. L. Comar has succeeded J. R. Lewis in agricultural chemistry for work on industrial utilization of agricultural products.

Nebraska University and Station.—Dr. Lewis F. Garey, professor and associate in rural economics since 1936, died July 24 in his fifty-fifth year. A native of Nebraska, he received the B. S. and M. A. degrees from the university in 1914 and 1915, and in the latter year became head of the agricultural department of the State Normal School at Peru. He had also served as assistant agriculturist in the Colorado College and Station from 1917 to 1919, as State supervisor of agricultural education in Colorado from 1919 to 1920, and as assistant professor of farm management in the Minnesota University and Station from 1920 to 1936 aside from a year's leave of absence to obtain the Ph. D. degree from Cornell University.

New York State Station.—William C. Haynes, assistant in research (bacteriology), has accepted a position with the U. S. D. A. Northern Regional Research Laboratory at Peoria, Ill., and has been succeeded by W. G. Walter.

North Dakota College.—Dr. Otto J. Beyers has been appointed coordinator of the national defense program, a position established to bring together all campus activities concerned with national defense.

Ohio Station.—Recent additions to the staff included Dr. W. R. Krill as associate in animal industry, Dr. A. R. Mangus as associate in rural economics and sociology, and the following assistants: J. H. Wilson and Dr. R. Q. Parks in agronomy, Dr. R. E. Cray in animal industry, Dr. J. B. Polivka and N. D. Blackburn in entomology, C. B. Richey and W. A. Junnila in agricultural engineering, John D. Thewlis and R. C. Headington in rural economics and sociology, and Dr. Alvin C. Wolfe in horticulture.

Puerto Rico Federal Station.—Dr. Oscar Loew, widely known as a pioneer plant physiologist and attached to the station for brief periods in 1907, 1909-10, and 1912, died in Berlin on January 26, 1941. Born in Germany on April 2, 1844, he studied in various German institutions, including the Universities of München and Leipzig and with a year in Liebig's laboratory in Glessen. He first came to the United States in 1867 and spent several years as a scientific observer for the War Department in its geographical and geological surveys west of the 100th meridian. He returned to Germany in 1886, and for 4 years was professor of agricultural chemistry in the University of Tokyo, Japan. Then followed 3 years with the U. S. Department of Agriculture as an expert in plant physiology, much of which was spent in research on tobacco in Florida and Connecticut. During this period he enunciated his theory of the relation of lime and magnesia to plant growth. His Puerto Rico work dealt mainly with fermentation processes in cacao and coffee, soil acidity, and soil protozoa and disinfectants. He also studied the utilization of calcium by plants and animals and the functions of several minor elements, catalase, and other enzymes. Since 1913 he had lived in Germany.

Rhode Island College.—Dr. Carl R. Woodward, secretary of Rutgers University, has been appointed president, effective November 1.

Utah Station.—Significant progress has been made during the past season at the Utah Station in its research in cooperation with the U. S. D. A. Western Regional Research Laboratory on freezing preservation of fruits and vegetables. The station has constructed a new laboratory building at the fruit and vegetable research farm in Davis County where fruits and vegetables may be processed and frozen, and the Regional Laboratory in association with industrial collaborators has furnished most of the processing and freezing equipment. The cooperative research involves a study of several varieties of peas and lima beans as well as other vegetables, and also varieties of the different fruits. Production and processing studies are to be followed up to obtain consumer acceptance of the various products, which are being prepared and used in many ways.

H. H. Cutler, research assistant professor of agricultural economics, has been granted a year's leave of absence effective September 1 for graduate studies in agricultural economics at the Iowa State College.

Virginia Station.—J. B. Elrod, assistant agricultural engineer, resigned June 30.

Washington College and Station.—Dr. F. D. Heald, in charge of the work in plant pathology since 1915, retired September 1 from administrative duties as head of the college department and station division of plant pathology, but will continue his teaching and research as professor of plant pathology and plant pathologist emeritus. He has been succeeded as head of the department and division by Dr. J. G. Harrar, associate professor of biology at the Virginia Polytechnic Institute.

Dr. Jennie A. McIntosh, nutrition chemist, has been appointed acting assistant home economist vice Mildred M. Boggs, on leave for graduate work. Virginia Lindquist has been appointed nutrition chemist. Other appointments include T. W. Daniel of the California Forest and Range Experiment Station as grazing specialist in the station and Western Washington Substation, to conduct studies on grazing possibilities on cut-over and burned-over lands in western Washington, vice Donald Peters, resigned; Carroll Draper as assistant poultry husbandman vice Dr. E. I. Robertson, resigned; and Alvin G. Law as assistant in farm crops vice E. J. Krezinger, transferred to the U. S. D. A. Bureau of Plant Industry.

Wisconsin University and Station.—The 1941 legislature gave the university a slightly larger appropriation than was received during the past year. The station received increases totaling something over \$20,000 annually for research in certain special crops, including canning crops, potatoes, truck crops, and tobacco. A new appropriation of \$15,000 annually was provided for a study of reproductive diseases of cattle (aside from Bang's disease). A new assembly hall and dormitory for the Farm Folk School (Short Course) is provided by a \$200,000 appropriation.

A study by the station of the possible role of nutrition in the incidence of infantile paralysis, using monkeys as the experimental animals, has been begun with a grant of \$62,000 available over a 5-year period from the National Foundation on Infantile Paralysis. The study will be conducted in cooperation with the University School of Medicine,

Dr. Henry M. Munger has been added to the staff of the department of horticulture for research on vegetable crops. Dr. Ira L. Baldwin, assistant dean of the College of Agriculture, has been appointed head of the department of agricultural bacteriology, relieving E. G. Hastings, chairman since 1910, who is continuing in other department work. Dr. Clayton E. Holmes, assistant professor of poultry husbandry and assistant poultry husbandman, has resigned to become associate professor of poultry husbandry in the Oregon College and was succeeded on July 1 by William H. McGibbon as instructor and assistant in poultry husbandry.

Association of Land-Grant Colleges and Universities.—Announcement is made that because of congestion in Washington, D. C., the 1941 convention has been transferred from that city to the Stevens Hotel, Chicago, Ill. No change has been made in the dates previously set of November 7-9 for the pre-convention sessions and November 10-12 for the convention itself.

EXPERIMENT STATION RECORD

VOL. 85

DECEMBER 1941

No. 6

TWENTY YEARS OF THE U. S. D. A. GRADUATE SCHOOL

On October 17, 1921, graduate courses of instruction were begun under the auspices of the U. S. Department of Agriculture. As indicated in the initial prospectus, the objective of this unique undertaking was "to enlarge and improve the service rendered by the Department by affording an opportunity to those who wish to fit themselves for greater usefulness through better training and increased knowledge." Organized with the interests of the Department and its personnel primarily in mind, it was nevertheless recognized as of broader appeal and influence than a mere agency for in-service training. Officers of the Association of Land-Grant Colleges and Universities, for instance, participated in its formation, and its operation has been a matter of interest to other graduate schools, the colleges of agriculture, the experiment stations, and other institutions engaged in education and research.

The 20 years which have now gone by have been a period of noteworthy expansion and development. Opening its doors with a few courses in agricultural economics, biochemistry, genetics, crystallography, mycology, plant physiology, and statistical mechanics and methods, the school this fall schedules 142 courses, of which 38 are entirely new. These courses are organized under the eight departments of biological sciences, economics and social sciences, engineering and mechanical arts, language aids, mathematics and statistics, office skills, physical sciences, and public administration. A partial list of the faculty presents 128 instructors for the current semester. The initial enrollment of 213 course registrations in 1921-22 has grown to a total of 3,225 registrations, representing 2,755 students, in the first semester of the current academic year. More than 3,300 individuals were enrolled last year.

Set up as an unofficial system of advanced instruction in subjects relating to the Department's work in which adequate instruction was not otherwise available, in general the courses are still those not obtainable at local institutions or offered only in working hours. However, some broadening of scope has seemed desirable. A wide-

spread need of more elementary foundation work of undergraduate level has been recognized, especially in mathematics and modern languages, as has also the demand for courses more apparently cultural than professional. One of the recent developments has been the greatly increased interest in Spanish and Portuguese language and literature and the offering of an orientation course on Latin America and the United States.

Two limitations which loomed large when the school was under consideration have proved to be not insuperable. The absence of authority to confer degrees has been minimized in practical importance, since, as was noted in a recent address by Federal Security Administrator Paul V. McNutt, "so sound has been its work that its courses are accredited and accepted by the outstanding universities of the country." Students have been certified to about 50 institutions of higher learning. Full recognition has also been accorded by the U. S. Civil Service Commission.

The necessary restriction of classroom hours to late afternoon and evening periods has probably been less of a handicap than anticipated. Recently the problem has been further complicated by a staggering of working hours in Washington to combat traffic congestion, causing much divergence between the various branches of the Government from whom the student body is mainly recruited. For the most part the hours utilized are from 5 to 7 p. m., but the resulting inconvenience is lessened by the fact that the average course meets but once or twice weekly.

A more serious impediment has doubtless been the virtual absence of laboratories. Perhaps for this reason the number of courses in the biological and physical sciences is still relatively small. Although nearly 50 classrooms are available in the Department buildings, mostly rooms used as departmental offices through the working day, the space situation is somewhat of a problem. Provision is also made in a few other Government buildings, including the Smithsonian Institution, for certain courses utilizing special facilities, and the Department of Agriculture Library, now containing approximately half a million books and pamphlets, is freely available.

One advantage on which the school relied has been the presence on the Department's own staff of many specialists competent to offer courses of high grade and unique content. This asset has been freely availed of. Much of the instruction is done by members of the Department of recognized authority and long teaching experience, and others are faculty members in active service from nearby universities. The scope and flexibility of many of the courses render much of the instruction outstanding. Current courses on useful plants of the American Tropics, research methods in the social sciences, economic

problems of a post-war world, rural social psychology, and extension organization and program determination may be mentioned as among the many listed of this sort. The offering of some of these courses would be impracticable for even the most broadly organized universities and colleges of agriculture, so that the school is rendering a direct service to research and education in general.

Although a duly authorized agency of the Department, the school is a self-supporting, nonprofit institution. It receives no Federal funds, deriving its income from student fees now set at from \$6 to \$7 per credit hour. Its government is vested in a general administration board, appointed by the Secretary of Agriculture and at present numbering among its membership the Directors of Research and Personnel, the Chiefs of the Bureaus of Agricultural Chemistry and Engineering, Agricultural Economics, and Plant Industry, and the Governor of the Farm Credit Administration. Its administration is vested in a director, now Dr. Eldon L. Johnson, and a small administrative staff. These have the counsel and assistance of the director emeritus and educational adviser (Dr. A. F. Woods, director of the school from 1926 to 1941) and eight committees representing the major departments of the school.

Special mention should be made of the service rendered through the public lectures developed in recent years. In the words of a recent commendatory article, "these have included series in personnel administration, administrative management, the history of science, the philosophy of science, statistical methods, conservation of health, current economic problems, current social problems, psychology today, and the adjustment of personality. The average length of each series is 10 lectures. The speakers have been the prominent authorities in this country and Europe. The audiences have averaged between four and five hundred, and sometimes have filled [an] auditorium which can seat 900. . . . In most cases the lectures have been published and made available at cost."

By way of summary, the view may be expressed that the progress of the school well illustrates the old adage that "where there's a will there's a way." In the beginning serious difficulties were foreseen, of which the lack of precedent, permanent endowment, and assured academic status were only a fraction. Nevertheless, the organizers and their successors refused to allow possible objections to be determinative. The results have justified their policies and made real their vision.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Idaho Station] (*Idaho Sta. Bul.* 239 (1941), pp. 49, 50, 51, 61-64, figs. 2).—Investigation of methods for the preservation of the carotene content of alfalfa is reported upon by D. W. Bolin and C. E. Lampman, and measurements of oil contents of the safflower and castor-beans by L. M. Christensen and K. H. Klages. Also, yields of alcohol and byproducts have been improved by the use of a new saccharifying agent and an improved cooking process, and sources and markets for alcohol investigated by M. Aslett, H. Beresford, Christensen, E. Graham, and G. Taylor.

[Bacteriological and chemical investigations by the Massachusetts Station] (*Massachusetts Sta. Bul.* 378 (1941), pp. 22-23, 24, 35-37, 38, 78, 79, 80, 81, 82).—The bacteriological work included a study of spices and spice oils, by J. E. Fuller and F. J. Wishart; of effects of temperature on the differential reactions of coliform bacteria, by Fuller and S. Levine; of fecal streptococci, by Fuller and R. S. Lubitz; and of methods for determining the sanitary quality of drinking utensils, by R. L. France, W. E. Cassidy, and Fuller; work on the streptococcus test as an index of the sanitary quality of drinking utensils, and on *Neisseria catarrhalis* as an index of pollution in swimming-pool water, both by France.

The department of chemistry reports upon tests of spray materials; lignin and its relation to the absorption of minerals by plants, and the effect of storage and processing on carbohydrates of some varieties of edible onions, both by E. Bennett; the progressive decomposition of fish muscle, by W. S. Ritchie and P. N. Simon; and of the preservative values of organic acids, by A. S. Levine; studies of cranberry seed oil, cranberry skins and seeds, and use of dextrose in cranberry sauce, by C. R. Fellers and Levine; cider jellies and marmalades, by Fellers, Levine, and F. B. Voit; a new method of making orange marmalade and use of dextrose in canned grapefruit and juice, by A. Sedky, Fellers, and W. H. Fitzpatrick; canning crab meat, by Fellers; glass container research, by Fellers, K. R. Newman, and Fitzpatrick; and fruit juice concentration, by L. R. Tucker.

The chemical composition of forest fruits and nuts from Pennsylvania, W. W. WAINIO and E. B. FORBES. (Pa. Expt. Sta. et al.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 10, pp. 627-635).—With a view to wildlife conservation by forest management designed to encourage the growth of the more desirable food species, the authors examined 35 mast foods, the conventional food analysis being supplemented by determinations of tannin, cellulose, lignin, available protein, calcium, magnesium, and phosphorus.

The sum of the lignin and cellulose fractions was invariably found to be higher than the value determined for crude fiber. In all products the content of available protein was less than that of crude protein. The values for nitrogen-free extract of mast foods are considered of more questionable significance than the corresponding values for foodstuffs in general because they include the tannin fraction, which

reached a maximum of 11.28 percent, on the dry basis, in the acorn of the scrub oak. The fruits and berries are, for the most part, relatively rich in nitrogen-free extract and much less rich in protein and ether extract. They are of only moderate nutritive value and serve mainly for energy production. The nuts are of greater value, especially because of their content of protein and fat. In contrast to most fleshy fruits, those of bittersweet, cucumbertree, panicled dogwood, and spicebush are remarkably rich in ether extract and are, therefore, relatively concentrated foods.

The hazelnut, hickory nut, and black walnut are very concentrated foods, containing much ether extract and protein and very little nitrogen-free extract. Among nuts they are relatively rich in phosphorus. Almost all of the nuts analyzed were exceedingly low in calcium, and they usually contained much more magnesium than calcium. Chestnuts, buckeyes, and most acorns are oil-poor and are relatively rich in nitrogen-free extract; they are not so rich in protein as are the oil-bearing nuts. The products richest in tannin were the acorns, chokeberries, sumac berries, blackhaw, narrowleafed crab apple, and mountain-ash berries.

[Tobacco investigations at the Kentucky Station] (*Kentucky Sta. Rpt. 1940, pt. 1, p. 31*).—Possible recovery from low and medium grades of dark tobacco of constituents other than nicotine for which some new commercial uses may be found was suggested by analytical results.

III. Peptization of peanut proteins, B. B. HIGGINS, K. T. HOLLEY, T. A. PICKETT, and C. D. WHEELER (*Georgia Sta. Bul. 213 (1941), pp. 14-18*).—Part 3 (page 757) states that these proteins may be dispersed with water about as well as by neutral salt solutions. The results show no correlation between the amount of N dispersed and the conductivity of the dispersion; and they correlate neither with the pH of the dispersion nor with the lecithin content of the peanuts.

Mercuric chloride as a preservative of cyanogenetic plants for chemical analysis, R. R. BRIESE and J. F. COUCH. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 62 (1941), No. 8, pp. 493-507*).—Good preservation was obtained for periods up to 6 mo. and, in a number of cases, for 1, 1.5, and 2 yr. Young plants are more difficult to preserve than older plants because of their higher content of hydrocyanic acid, the rapidity with which it is developed in bruised tissues, and, apparently, because the cyanogenetic enzyme is much more susceptible to the inhibiting action of mercuric chloride than in older tissues. One percent of mercuric chloride based on the weight of the plant sample is sufficient to preserve specimens containing from 100 to 125 mg. of hydrocyanic acid per 100 gm. Larger quantities of the acid require from 2 to 3 percent of mercuric chloride for satisfactory preservation. Concentrations larger than 3 percent markedly inhibit cyanogenesis. The rate of cyanogenesis in the plants studied when they were preserved in 1 percent of mercuric chloride is such that, in general, the maximum amount of hydrocyanic acid is liberated in from 3 to 8 weeks. With higher concentrations of the mercury compound the maximum quantity may not be attained for from 6 to 12 mo. The rate of cyanogenesis in the preserved samples could not be regularly increased by the addition of the appropriate enzyme to the sample. The cyanogenetic enzymes dhurrinase and prunase did not affect the stability of a solution of mercuric cyanide over a period of 15.5 weeks. Mercuric oxide and mercurous chloride were less efficient as preservatives than mercuric chloride. The H-ion concentration of mixtures of sorghum and mercuric chloride falls within the optimum pH range for cyanogenesis in sorghum.

Figures for the hydrocyanic acid obtained from samples of plants macerated in water, except for a few irregular cases, fall much below those obtained by the use of mercuric chloride. Water maceration cannot be relied upon to furnish accurate data for the hydrocyanic acid content of cyanogenetic plants.

The limit of error of the simplified vacuum solids test as applied to ice cream mix, evaporated and sweetened condensed milk, L. G. HARMON and K. M. RENNER (*Jour. Dairy Sci.*, 24 (1941), No. 7, pp. 625-634, fig. 1).—Tests were conducted comparing results obtained with the simplified vacuum solids test¹ and the Official methods for determining solids in evaporated milk and sweetened condensed milks and the adapted Official method for ice cream mix. Fifty tests were conducted by the simplified method on a sample of each product. With evaporated milk the arithmetic mean of the error was 0.1529, and 96 percent were within 0.25 percent of the Official. With sweetened condensed whole milk the arithmetic mean of the error was 0.3944, and all results were within 1 percent of the Official. With sweetened condensed skim milk the arithmetic mean of the error was 1.2776, but 58 percent varied more than 1 percent from the Official. With ice cream mix the arithmetic mean of the error was 0.5090, and 98 percent were within 1 percent of the Official. The simplified test can be performed in from 20 to 25 min., and the results compared favorably with those obtained from other methods by previous workers.

The detection and determination of dried skim milk in meat products, W. C. McVey and H. R. McMILLIN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 4, pp. 811-821).—Lactose in meat products may be accurately determined by a selective fermentation method which fails only in the presence of soluble reducing, nonfermentable sugars other than lactose. In the absence of substances containing sufficient calcium to interfere, dried skim milk may also be estimated by a determination of calcium. Such an estimation is applicable even to those samples that are received in such bad condition that the lactose may have been partly or wholly destroyed by bacterial action.

Determination of lactic acid in blood, S. ELGART and J. S. HARRIS (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 12, pp. 758-762, figs. 4).—After critical review of the methods available for lactic acid determination the Mendel-Goldscheider (veratrole) method was selected for standardization, and detailed consideration was given to study of the method for blood precipitation, the relation of sulfuric acid and veratrole concentration to the final color, the proportionality of color to concentration of lactic acid, and the adaptation of the Evelyn photoelectric colorimeter. The procedure as outlined and using 1 cc. of blood involves precipitation of the protein from the diluted hemolyzed blood by the slow addition of trichloroacetic acid with vigorous shaking; removal of interfering substances such as glucose and other carbohydrates by treatment with 15 percent copper sulfate solution, followed by addition of solid calcium hydroxide and centrifugation; oxidation of the lactic acid by standardized concentrated sulfuric acid; and development of color by the addition of veratrole solution (0.125 percent in absolute alcohol) under controlled conditions as to time and temperature. Color reading is facilitated by use of the Evelyn photoelectric colorimeter, filter 520 and a final volume of approximately 6 cc. being chosen. Specificity, simplicity, high sensitivity, and ability to perform a large number of determinations simultaneously are advantages claimed for the method. In 18 determinations the recovery of lactic acid added to blood averaged 97.4 percent, ranging from 94 to 101 percent. The bibliography includes 57 references.

Determining volatile acids in cheese, J. C. MARQUARDT and A. C. DAHLBERG. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 8, pp. 40-42).—The described method consists in direct steam distillation of cheese samples, with particular emphasis on the standardization of the volume of water

¹ Internatl. Assoc. Ice Cream Mfrs. Ann. Conv., Dallas, Rpt. Proc., 37 (1937), vol. 2, pp. 52-58.

for distillation and the size of the samples for different varieties and cheese of given ages. Samples of 200, 100, 200, and 25 gm. are recommended for young Cheddar, aged Cheddar, young semihard, and cured semihard cheeses, respectively. The procedure involved filling the 3,000-cc. flask with exactly 2,500 cc. of distilled water. The cheese sample was mixed in all cases with 400 cc. of water and 25 cc. of a 25-percent H_2SO_4 solution. An important development in the procedure was the collection of twenty 100-cc. aliquots of distillate, each of which was titrated with decinormal sodium hydroxide. The total decinormal sodium hydroxide used was expressed as the volatile acid equivalent for the sample.

Chemical determination of thiamine by a modification of the Melnick-Field method, A. D. EMMETT, G. PEACOCK, and R. A. BROWN (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 131-138, fig. 1).—The Melnick-Field method (E. S. R., 83, p. 11), modified by replacing the permittite adsorption and elution steps with a somewhat simpler technic, using superfiltrol as the adsorbent, and substituting the Lovibond tintometer for the colorimeter, was used in tests of possible interference of other vitamins and complex mixtures with the accuracy of the method.

In tests without preliminary adsorption, riboflavin, nicotinic acid, pyridoxine, and pantothenic acid did not interfere even when present in comparatively large amounts, but large amounts of ascorbic acid did interfere, giving lower values. This interference was overcome, however, by adsorption of the thiamin with superfiltrol. A comparison was also made of the biological method, the direct chemical method, and the adsorption-chemical method for the determination of thiamin in a thiamin standard, a yeast concentrate, dried brewers' yeast, wheat germ extract, and an elixir. The standard vitamin B_1 solution gave practically the same results by all three methods, 333.3, 335.7, and 333.8 units per milligram, respectively. With the three complex mixtures the values were not only lower by the direct chemical method than by the other two methods, but also decreased as the amounts for assay increased. With the adsorption method the results at all levels agreed closely and were within the practical limits of the biological tests.

A method for the determination of thiamine and certain of its metabolic products in urine, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Jour. Biol. Chem.*, 136 (1940), No. 3, pp. 713-717).—A method is described with respect to apparatus, reagents, and procedure for the rapid determination of the true vitamin B_1 content of urine. The method is based upon the fact that oxidation by alkaline ferricyanide inactivates thiamin with regard to the yeast fermentation test, although thiamin related substances in the urine are not inactivated under the conditions of the test. Determination of vitamin B_1 by fermentation before and after oxidation by alkaline ferricyanide gives, therefore, a measure of the thiamin and also of the thiamin break-down products active in fermentation. The efficiency of the inactivation of the thiamin is determined by the proportion of a superimposed quantity of thiamin which is inactivated in a parallel test. Results obtained for the two urines analyzed were in satisfactory agreement with results of rat growth tests conducted on the same urines.

Application of the sulfite cleavage of thiamin to the yeast fermentation method, A. S. SCHULTZ, L. ATKIN, C. N. FREY, and R. R. WILLIAMS (*Jour. Amer. Chem. Soc.*, 63 (1941), No. 2, pp. 632-633).—The method reported above partially solved the problem of specificity in the yeast fermentation method by involving oxidation of thiamin to the inactive thiochrome by alkaline ferricyanide. With substances of low potency, however, there was danger of loss or destruction of the vitamin. It is suggested in the present preliminary report that sulfite cleavage of the thiamin be introduced instead as a simple and convenient modification of the method. Under appropriate conditions of pH and temperature thiamin

is quantitatively (99 percent) cleaved by sulfite to yield 2-methyl-6-amino-pyrimidine-5-methyl-sulfonic acid and 4-methyl-5-(β -hydroxy)-ethylthiazole. Neither of these substances nor 2-methyl-5-ethoxymethyl-6-amino-pyrimidine nor 5-hydroxymethyl-pyrimidine or its esters—all potential interfering substances—has been found active in the yeast fermentation method for thiamin determination. The new method consists, therefore, in determination of the fermentation response before and after sulfite treatment, the difference representing apparently the true thiamin content of the unknown.

As outlined the modified procedure involves treatment of a solution or suspension of the unknown in a volume of 20 cc. with 0.2 gm. of $\text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O}$ and adjustment of the pH to 5.0. After 30 min. in flowing steam the mixture is cooled, excess sulfite is destroyed with 3 percent H_2O_2 , using acidified starch-iodide as an outside indicator. The pH is adjusted to pH 6.2 and made up to volume, an aliquot of this mixture being assayed for its effect on fermentation. In preliminary studies, it is noted, satisfactory results have been obtained by this method.

II. Thiamin chloride and nicotinic acid content of peanuts and peanut products, B. B. HIGGINS, K. T. HOLLEY, T. A. PICKETT, and C. D. WHEELER (*Georgia Sta. Bul. 213 (1941), pp. 11-14*).—This, part II of this bulletin (see page 757), states that the average thiamin chloride content of 29 selected strains of raw whole peanuts was 9.6 μg . per gram, moisture-free basis. The skins contained the highest percentage of thiamin chloride, the cotyledons next, and the germs the lowest. The average nicotinic acid content of 21 selected strains of raw whole peanuts was 17.2 mg. per 100 gm., moisture-free basis. On the basis of one sample each, the germs contained the highest percentage of nicotinic acid, the cotyledons next, and the skins the lowest. The heat treatments during the processing of peanuts for butter, meal, and the confectionery trade resulted in large and varying losses of thiamin chloride but in no appreciable losses in nicotinic acid. No appreciable amount of thiamin chloride in peanuts was destroyed at 75° C. for 5 hr., whereas at 150° over 85 percent was lost in 2 hr.

AGRICULTURAL METEOROLOGY

The rotational properties of the earth and their influence on weather [trans. title], B. NEIS (*Met. Ztschr. [Braunschweig], 58 (1941), No. 2, pp. 45-53, figs. 4*).—The rotational properties of the earth have hitherto been applied in meteorology to explaining the deviation of winds and the subtropical high pressure zone. The author here discusses the relationship of certain physical phenomena connected with the earth's rotation to changes in the weather.

Relation of weather to pressure and temperature gradients [trans. title], K. BURKHART (*Met. Ztsch. [Braunschweig], 58 (1941), No. 4, pp. 150-152, fig. 1*).

The sun spot cycle and temperature departures at Indianapolis, Indiana, 1872-1936, W. T. BUCKLEY (*Ind. Acad. Sci. Proc., 55 (1939), pp. 159-162, figs. 4*).—The following conclusions are drawn: "Temperature departures from the average are most likely to agree inversely with sunspot departures when the period used is the epoch of maximum and minimum sunspot activity. Over a 62-yr. period at Indianapolis, which covered 11 epochs, there was an agreement of 82 percent. With shorter time intervals, the year or the month, the agreement becomes less pronounced, that for the year being 62 percent and that for the month 51 percent. The monthly agreement is about what might be expected from the operation of the law of chance. Agreement in trend seems to be less significant than the actual agreement in departure from the average.

There is no evidence that a lag interval of 1 mo. or more increases the percentage of agreement."

Weather observations (*Louisiana Sta., Rice Sta. Bien. Rpt. 1939-40, pp. 4-5*).—Temperature and rainfall statistics for Crowley, La., are summarized with relation to rice and other farm crops.

Weather (*Rhode Island Sta. Rpt. [1940], pp. 68-69*).—A brief summary of rainfall and other meteorological data.

Meteorological studies.—A, Climate and evaporation in Alpine and Arctic zones; B, Temperature of Arctic soil and water, J. E. CHURCH. (Nev. Expt. Sta. et al.). (*Mich. Univ. Studies, Sci. Ser., 6 (1941), No. 2, pp. 1-60, pls. 21, figs. 6*).

The influence of the weather on crop yields in Indiana studied by the climograph technique, S. S. VISHER (*Ind. Acad. Sci. Proc., 55 (1939), p. 118*).—An abstract.

An August frost (*Connecticut [New Haven] Sta. Bul. 444 (1941), p. 269*).—A note on damage to tobacco from this unusual frost.

Freak weather damages trees and shrubs, P. P. PIRONE (*N. J. Agr. [Rutgers Univ.], 23 (1941), No. 3, p. 1, fig. 1*).—Strong polar winds in March caused the leaves of rhododendrons and other evergreen shrubs and trees to lose water faster than it could be replaced through roots that were still in frozen soil, resulting in wilting of the leaves. Other climatic factors served to aggravate the trouble.

SOILS—FERTILIZERS

[Soil investigations by the Idaho Station]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 239 (1941), pp. 32-33, 48-49*).—Progress in soil-science research is reported on the effect of organic-matter additions to the soil on crop yield, protein content of wheat, and soil and water losses; the use of commercial fertilizers as a supplement to manures and rotations; and the control of alfalfa yellows with boron, all by G. O. Baker; and the influence of CO₂ on sorption of organic colloids by clay minerals and the base-exchange capacity of Idaho's soils, both by L. E. Ensminger.

[Soil investigations by the Massachusetts station] (*Massachusetts Sta. Bul. 378 (1941), pp. 11-13, 14-15, 17-18, 22, 38-39, 57, figs. 2*).—Progress in the following investigations is reported: The absorption by food plants of chemical elements important in human nutrition, the intake by plants of elements applied to the soil in pairs compared to the intake of the same elements applied singly, and magnesium requirements of plants, all by W. S. Eisenmenger and K. J. Kucinski; the relative toxicity of certain ions and the function of the calcium ion as an antagonist as indicated by soybean roots, by Eisenmenger and P. Corbett; the effect of the calcium ion on the development of soybean seedlings and the antagonism of this ion to arsenic, boron, and selenium ions, by Eisenmenger and E. T. Miles; the effect of arsenious, arsenic, and antimony oxides on soil and plant growth, by Eisenmenger and H. M. Yegian; erosion problems arising from changes in land use, and factors affecting wind erosion, both by Kucinski and Eisenmenger; movement of lime in pasture soils, by A. B. Beaumont; the effect of fineness of limestone on soil reaction, by R. W. Donaldson, Eisenmenger, and Yegian; nitrification in soils containing plant residues of high lignin content, by J. E. Fuller; and the influence of base-exchange capacity and of exchangeable ions in Massachusetts soils on the availability of potassium, the relationship of base-exchange capacity, exchangeable hydrogen, and soil reaction to the lime requirement of Massachusetts soils, and the fixation of arsenic in soils and the influence of arsenic compounds on the liberation of fixed phosphorus in soils, all by D. H. Stieling.

[Soil investigations by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 31-35, 39-40).—These have shown an effect of crops on soil acidity and of chloropicrin sterilization in overcoming the influence of the previous crop. Optimum levels of nitrate nitrogen for vegetable crops were studied, as were magnesium availability in fertilizer components and rapid soil tests.

Soil survey of Jefferson County, Tennessee, J. W. MOON ET AL. (Coop. Tenn. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1935, No. 20, pp. 104, pls. 8, figs. 5, map 1).

Chemical data of Puerto Rico soils: Correlation of data for humid and arid areas; field response of crops to available phosphorus and potash in soils, J. A. BONNET (*Puerto Rico Univ. Sta. Res. Bul.* 1 (1941), pp. 53; *Span. abs.*, p. 53).—Data are reported for soil reaction, total nitrogen, organic matter, and available phosphoric acid, lime, and potash for surface samples of 312 soil types. Data for the soil types are grouped into two main climatic regions, the humid and the arid. The soils of the humid area are found to be 52 times more acid than the soils of the arid region, but have about twice as much organic matter and about half as much available phosphoric acid and lime. The soil series from both areas were found to contain about the same total nitrogen and available potash. Field responses of some crops to applications of phosphoric acid and potash have been correlated with inherent soil supplies of available phosphoric acid and potash.

Phosphoric acid and silica of Puerto Rico soils, J. A. BONNET (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 24 (1940), No. 4, pp. 143-150; *Span. abs.*, p. 150).—One hundred and nine soil samples from three areas in the humid region of Puerto Rico are grouped into five textural soil classes according to their mechanical composition, irrespective of their altitudes, and data are reported for pH and total and available phosphoric acid and silica.

The mineral composition of crops with particular reference to the soils in which they were grown: A review and compilation, K. C. BEESON (*U. S. Dept. Agr., Misc. Pub.* 369 (1941), pp. 164, figs. 2).—Following a brief introduction, this publication takes up soil characteristics which have been related to nutritional diseases of man and animals and factors affecting the mineral composition of plants. A list of 607 references to publications cited in the review is included, together with 23 references to unpublished material and an appendix consisting of tables compiled for the principal and minor elements of some important crops.

Twenty-two years of soil fertility investigations in the Willamette Valley, Oregon, W. L. POWERS and C. V. RUZEK (*Oregon Sta. Bul.* 387 (1941), pp. 23, figs. 7).—Results of fertilizer experiments are reported covering the needs for major nutrient element or elements and the rate at which they are used, as well as a study of causes of infertility and the importance of minor elements for plant growth. Liming was found to be necessary in connection with the efficient growing of leguminous crops. Potassium was especially important on leached sandy soils and on peat soils, and phosphorus was necessary on the red-hills soils and old grain-farmed lands to improve yield and quality. Most efficient results were obtained through the use of an available form of phosphorus. Emphasis is placed upon the importance of maintaining soil organic matter through the use of proper crop rotation with legume residues, livestock feeding, and manuring. Calcium sulfate was found to be a suitable source of sulfur. The importance of the use of more concentrated fertilizers and a lower number of grades to reduce costs and transportation charges is discussed.

The absorption of proteins by montmorillonitic clays and its effect on base-exchange capacity, L. E. ENSMINGER and J. E. GIESEKING. (Ill. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 2, pp. 125-132, fig. 1).—X-ray studies indicated

that proteins were absorbed within the expansible portion of the lattice of montmorillonitic clays. The amount and nature of the protein added determined the change in the spacing of montmorillonite resulting from the absorption. The montmorillonite from bentonite was found to be more expansible than montmorillonitic clay in Hartsburg colloid. The base-exchange capacity of montmorillonite and Hartsburg clay was reduced by the proteins under acid conditions. However, in an alkaline suspension no reduction occurred. Treatments which increased the basic properties of proteins increased the absorption of proteins by clays, while treatments which decreased the basic properties resulted in less absorption and a smaller decrease in the exchange capacity of the clay.

The effect of temperature upon the base-exchange capacity of clays, A. A. COLÓN (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]* 24 (1940), No. 4, pp. 133-142; *Span. abs.*, p. 142).—The clay fraction of Crowley silt loam was divided into equal portions, which were saturated with the chlorides of potassium, sodium, calcium, magnesium, and hydrogen. A part of each of the saturated portions was heated at 25°, 50°, 75°, and 100° C. for 0, 5, 12, and 46 days, respectively. The amounts of replaceable potassium, calcium, and acid hydrogen decreased with prolonged treatment, while that of sodium and magnesium increased. Total exchangeable bases showed an increase in the potassium and acid hydrogen clays and a decrease in the sodium, calcium, and magnesium clays upon prolonged thermal treatment.

Soil reaction or pH and what it means, F. B. SMITH. (Univ. Fla.). (*Citrus Indus.*, 21 (1940), No. 11, pp. 8, 15).—A general discussion of the meaning of soil pH, with an explanation of the concentration of H and OH ions at various pH levels.

Ultra-mechanical analysis of soils, A. N. and B. R. PURI (*Jour. Agr. Sci. [England]*, 31 (1941), No. 2, pp. 171-177).—A micropipette apparatus which has been used successfully for pipetting at extremely small depths for determining the ultramechanical analysis of soils is described.

Differences in the aggregation of a Prairie and a Gray-Brown Podzolic soil, J. L. RETZER and M. B. RUSSELL. (Iowa Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 52 (1941), No. 1, pp. 47-58, figs. 5).—The authors discuss the importance of soil structure in relation to several soil properties. Studies of aggregation are reported for Albion silt loam and Weller silt loam, two soils developed from identical parent materials but under different types of vegetation. Aggregation, measured by the Yoder method (E. S. R., 75, p. 592), indicated highly significant differences in aggregation between different vegetative areas within each soil type. The authors indicate that the formation of water-stable aggregates is facilitated through the additions of organic materials to the soils studied. In connection with aggregation introduced by sucrose over alfalfa or cornstalks, the authors suggest that a large percentage of the aggregation of soils is not due to the organic matter added but perhaps to the mucus and slime secreted by the organism using the organic materials as food source.

Soil aggregation and water percolation study from a limited area in the Salt River Valley, Arizona, B. I. JUDD, H. HUNSAKER, and M. GOLDMAN (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 652-656, figs. 3).—Aggregation analysis and percolation are reported from productive and unproductive areas of Sunrise clay loam and Sunrise silty clay to determine the relation of productivity to soil conditions on alkali spots. In the productive soil aggregation was 15.6 percent, while in the unproductive one it was only 2.8 percent. The average percolation was 0.51 in. per hour for the productive area as compared with no percolation from the soil of the alkali spot. The authors suggest that poor soil aggregation and consequent decreased percentage of soil air are related to low soil productivity.

Capillary rise and capillary movement of moisture in fine sands, P. C. CARMAN (*Soil Sci.*, 52 (1941), No. 1, pp. 1-14, figs. 2).—The author reports that the height of capillary rise of moisture in a fine sand is calculable from the particle size and porosity. Experiments are presented wherein the capillary rise of several liquids was determined in a bed of spherical glass particles in three different sizes of sand.

Soil-porosity in relation to gaseous- and water-movement, L. D. BAVER. (Ohio State Univ., U. S. D. A., land-grant colleges of Calif., Colo., Fla., Md., Mont., Oreg., Utah, Wash., et al.). (*Amer. Geophys. Union Trans.*, 21 (1940), pt. 2, pp. 414-433).—Air and water relationships within the soil are considered in relation to the amount and character of pore space. The type of water movement, according to the effective force, is divided into that which moves in the larger pores through the action of gravity and that which moves in small pores by capillary forces. The movement by capillary forces is termed movement in unsaturated soils, whereas movement by gravitational forces is discussed as movement in saturated soils. The movement of moisture and air is related to the number and size of the pores. The need for further research on the action of the larger pores in water and air movement in soils is stressed, with discussions (pp. 419-433) by A. B. C. Anderson, G. B. Bodman, R. Gardner, W. Gardner, C. V. Givan, R. E. Horton, B. A. Bakhmeteff and N. V. Feodoroff, M. R. Huberty, J. Kittredge, M. R. Lewis, O. W. Monson, R. E. Moore, G. W. Musgrave, O. R. Neal, L. B. Olmstead, L. A. Richards, L. K. Sherman, F. B. Smith, R. E. Stephenson, C. A. Taylor, R. P. Thomas, F. J. Veihmeyer, L. C. Wheeting, and N. E. Edlefsen.

A comparison of the Briggs-McLane and the Goldbeck-Jackson centrifuge methods for determining the moisture equivalent of soils, G. M. BROWNING and F. M. MILAM. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 4, pp. 273-278).—Comparisons are given of moisture equivalents for 58 samples of important soil types of the United States determined in a regular centrifuge equipped with trunion cups and Gooch crucibles as containers for the soil, as described by A. T. Goldbeck and F. H. Jackson, and in the Briggs-McLane centrifuge. The range in difference between the two methods was -0.9 to +1.9 inclusive, the Gooch crucible procedure averaging 0.76 percent less than determinations made in the Briggs-McLane moisture-equivalent machine. Satisfactory results for most purposes can be obtained by using the equipment recommended by Goldbeck and Jackson when a Briggs-McLane moisture-equivalent centrifuge is not available.

The avallameter and its use in soil moisture control.—I, The instrument and its use, R. B. ALLYN and R. A. WORK. (U. S. D. A. and Oreg. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 4, pp. 307-321, pl. 1, figs. 2).—In connection with the irrigation studies at Medford, Oreg., it was found especially advisable to regulate soil moisture closely in the major portion of the rooting zone of pear trees. In order to accomplish this the authors developed an instrument called the soil-moisture avallameter. The avallameter and the technic of operation are described in detail. The instrument measures soil stability, and the authors have established a relationship between stability and moisture content of the soil. The results are limited to medium or heavy soils.

A greenhouse method of maintaining soil moisture below field capacity, C. O. GRANDFIELD. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 4, pp. 371-373, figs. 2).—The accurate control of soil-moisture content in plant containers has been a problem confronting investigators in plant research. The author reports a system of irrigating soils in containers

through the use of an irrigating coil made from $\frac{1}{4}$ -in. copper tubing $4\frac{1}{2}$ ft. long for a clay pot 7 in. in diameter and 9 in. tall. Two rows of holes approximately $\frac{1}{16}$ in. in diameter are placed at 1-in. intervals on both sides of the tube.

Erosion and related land use conditions (*U. S. Dept. Agr., Soil Conserv. Serv., Erosion Survey, 1940, No. 15, pp. 52, pl. 1, figs. 16, maps 2; 1941, Nos. 17, pp. [1]+33, figs. 11, maps 3; 18, pp. [1]+46, figs. 11, maps 2; 1940, No. 19, pp. [1]+38, figs. 13, maps 2; 1941, No. 20, pp. [1]+37, pl. 1, figs. 6, maps 2*).—Continuing the series (*E. S. R., 84, p. 736*), conservation surveys are reported as follows: Nos. 15, Conestoga Area, Pennsylvania, by J. A. Bonstell and T. C. Bass; 17, Winona County, Minnesota, by M. H. Brown and I. J. Nygard; 18, Illinois Bayou Soil Conservation District, Arkansas, by C. J. Finger, Jr.; 19, Presque Isle Demonstration Project, Maine, by W. B. Oliver and C. W. Frutche; and 20, Chehalem Mountain Demonstration Project, Oregon, by H. N. Magness and M. F. Sandoz.

A study of soil erosion in the agricultural areas of Rhode Island and the comparative erodibility of five major soil series associated with these areas, E. A. PERRY. (*Coop. U. S. D. A. (Rhode Island Sta. Bul. 277 (1941), pp. 25, fig. 1*).—The location, kind, and seriousness of soil erosion in the State is discussed by counties. The physical and chemical properties of five soil series were studied in detail to determine the existence of any correlation between these properties and their erodibility. Areas devoted to market garden crops were found to show from slight to moderate sheet erosion. Small areas of sheet and gully erosion were found in some of the counties. Five of the major soil series were found to fall in the erodible class as indicated by erosion ratios. It is reported that the dispersion and erosion ratios of the topsoils in each series were in close agreement. It is, therefore, suggested that dispersion ratio might be used as a measure of the inherent erodibility of the soils in the area studied. Erosion ratio is thought to give a more satisfactory index as to erosion behavior of the soils investigated than did the clay ratio. Both observations and laboratory studies indicated the importance of soil organic matter in relation to erodibility of soils. The author discusses the importance of grass cover in erosion control.

The effect of contour-cultivation on runoff, H. C. KNOBLAUCH and J. L. HAYNES. (*U. S. D. A. and N. J. Expt. Stas. (Amer. Geophys. Union Trans., 21 (1940), pt. 2, pp. 499-504, figs. 7*).—A comparison of run-off phenomena expressed in run-off intensity, surface detention, and depression storage is made between contour tillage of corn and tillage with the slope on Dutchess stony loam by the use of hydrographs. Storage capacity obtained by contour tillage of a 16-percent slope was found to be approximately 0.2-in. depth before the contours were broken by run-off. The breaking of the contours resulted in reduction of storage capacity to approximately 0.09-in. depth.

Some effects of sheet erosion on soil microbiological activity, A. G. NORMAN and A. S. NEWMAN. (*Iowa Expt. Sta. (Soil Sci., 52 (1941), No. 1, pp. 31-46, figs. 3*).—The effect of erosion on activity, as well as number and kind of soil organisms present, was determined from a study of uneroded topsoil, eroded slopes, and deposited material from related areas. Limitations in the study of effects of erosion on soil population are discussed. In general, erosion reduces the organic matter content of exposed slopes, and, furthermore, the surface soil of eroded slopes does not contain a population so large or so active or effective in the decomposition of added organic matter as the normal topsoil of uneroded soil in the same general area. Deposited wash may be biologically very active, with the result that decomposition processes within it may be as rapid as in uneroded topsoil.

The influence of the method of sampling on the accuracy of the determination of bacterial numbers in the soil, G. W. HARMSEN (*Antonie Van Leeuwenhoek*, 6 (1939-40), No. 3, pp. 178-199, figs. 28).—The influence of the sampling and the preparatory treatment of soil samples on the counting of bacteria is reported. The present methods are deemed inaccurate and vary in duplicate determinations, to the extent even of rendering the effect of a perfected counting system quite negligible. In order to obtain better results, the author suggests a homogenization method, using a suspension of a sample made with water.

The isolation of soil bacteria that produce bactericidal substances, J. L. STOKES and C. R. WOODWARD, JR. (*Jour. Bact.*, 41 (1941), No. 1, p. 33).—A method is reported for isolating soil bacteria capable of producing bactericidal agents. Samples of soil were plated in low dilutions in order to obtain a large number of microbial colonies per plate. The resultant crowding of the colonies allowed any potential antagonisms that might exist between the various micro-organisms to become evident. By means of alcoholic extraction of the cells of some of the Gram-negative strains, the bactericidal principles have been obtained in a purified state.

The necessity for direct contact in sulfur oxidation by *Thiobacillus thiooxidans*, K. G. VOGLER and W. W. UMBREIT. (*Univ. Wis.*). (*Soil Sci.*, 51 (1941), No. 5, pp. 331-337, figs. 2).—It was found that a direct physical contact with the sulfur particle is necessary before sulfur oxidation can take place with *T. thiooxidans*. It was pointed out that it is not probable or necessary that the organism can render sulfur soluble in the medium. Further evidence is thus indicated that *T. thiooxidans* is similar to other cells in that no cell can obtain energy from oxidations which are not carried out at or within its boundaries.

Hydrogen inhibition of nitrogen-fixation by *Azotobacter*, O. WYSS and P. W. WILSON. (*Univ. Wis.*). (*Jour. Bact.*, 41 (1941), No. 1, p. 86).—Replacing a part of the nitrogen gas over an *Azotobacter* culture caused variations in the rate and extent of nitrogen fixation directly proportional with the pressure of nitrogen and inversely proportional with the pressure of hydrogen. It is concluded by the authors that hydrogen is a specific inhibitor of nitrogen fixation by the *Azotobacter*, and that fixation is dependent on the pressure of nitrogen only when nitrogen pressure is below 0.15 atmosphere. These findings indicate that the symbiotic and asymbiotic mechanisms of nitrogen fixation are similar in several fundamental respects.

The geographic distribution of *Azotobacter* and *Rhizobium meliloti* in Nebraska soils in relation to certain environmental factors, H. B. PETERSON and T. H. GOODRING (*Nebraska Sta. Res. Bul.* 121 (1941), pp. 24, figs. 5).—A total of 316 samples were collected from 38 important soil series in 78 of Nebraska's 93 counties, but none were taken from fields containing alfalfa or sweetclover. An examination for the presence of *Azotobacter* and *Rhizobium* revealed that 92.6 percent of the samples contained *Azotobacter* organisms, while only 40 percent of the samples showed the presence of *Rhizobium*. A study of the soil factors associated with the presence of *Azotobacter* indicated no relationship between pH, soluble phosphorus, or exchange property, except in one soil series where the presence of *Azotobacter* was associated with soils having the highest exchange capacity. A decrease in the number of samples containing *Rhizobia* was found to be associated with an increase in soil acidity. The presence of *Rhizobia* seemed to be associated with soil-series characteristics. From the survey it is concluded that the inoculation of legume seed would be advisable for several soil series. The application of lime would also

be beneficial by creating more favorable conditions for the growth of legume organisms.

Factors influencing excretion of nitrogen by legumes, O. WYSS and P. W. WILSON. (Wis. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 1, pp. 15-29, pls. 3, fig. 1).—The excretion of nitrogen by inoculated legumes is a controversial question. Results of investigations directed toward obtaining information on this question and defining some of the conditions necessary for obtaining excretion are reported. Greenhouse and outside coldframe experiments with hundreds of leguminous plant cultures kept under various conditions of growth showed only a few instances of positive evidence of excretion. Organic nitrogen accumulates in the nodule and is excreted as aspartic acid if environmental conditions are such that the plant fixes nitrogen at a rate in excess of its assimilation into new tissue. The authors thus indicate that in order to bring about excretion it is necessary that the physiology of the plant be directed along a certain pathway. The importance of the negative aspects of associated growth of legumes and nonlegumes in relation to excretion is pointed out.

Inspection of legume inoculants, H. R. KRAYBILL, C. W. HUGHES, and A. S. CARTER (*Indiana Sta. Cir.* 262 (1940), pp. 8).—Sixty-six official samples of legume inoculants and 30 official samples of growth-promoting preparations were inspected according to the Indiana law, the text of which is given.

Soil testing methods and apparatus designed for economy in time and labor, E. W. CONSTABLE and I. E. MILES (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 623-631, figs. 5).—The seasonal demand for soil-testing work makes it especially important that the technic for handling samples be worked out as efficiently as possible. The authors give the methods and equipment for handling the soil samples and making the various determinations according to the procedure followed in their laboratory.

Soil and plant-tissue tests as aids in determining fertilizer needs, G. D. SCARSETH. (Ind. Expt. Sta.). (*Better Crops With Plant Food*, 25 (1941), No. 3, pp. 9-11, 43-47, figs. 3).—The author reviews progress in the development of rapid chemical soil test methods for determining fertilizer practices. It is pointed out that the rapid chemical test has an important function but that certain limitations must also be considered. Relationship between the soil test and the plant-tissue test is pointed out, and several comparisons between them are presented. It is the opinion of the author that it would be of advantage to the grower to study the performance of the growing crop through the use of tissue tests. By this method he will be able to determine the status of the nutrient supply of the plant at any time during the growing season and will be able to make such corrective treatments as are needed for the next crops on that soil.

How to get the most out of your fertilizer treatment, C. B. SAYRE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, pp. 1, 6, 14).—Methods of application of fertilizers in relation to crop response are considered. Broadcasting of fertilizers and lime is not recommended, since certain fertilizer elements become fixed in the surface soil, and lime is usually not incorporated to sufficient depths to be of much benefit to growing plants. Results are presented on different methods of applying a 5-20-5 fertilizer for tomatoes. Plowing under two-thirds of the fertilizer and placing the rest in bands was found to be most effective in increasing the yield of tomatoes.

The concept of "available" nutrients in the soil, S. R. DICKMAN. (Ill. Expt. Sta.). (*Better Crops With Plant Food*, 25 (1941), No. 6, pp. 20-22, 42-44).—Consideration is given to the various meanings attached to plant nutrients in the soil, such as available, soluble, readily available, and replaceable.

The author expresses the viewpoint that the term "available nutrient" is misleading. It is suggested that since the calling of the nutrient available is based on its chemical form, which, according to the author, seems to be questionable, it would be better to use the term "nutrient form." The author thus concludes that if plant nutrients are classified on the basis of their chemical forms in the soil and those which can be shown to be absorbed by plants under test conditions are called nutrient forms, then correct emphasis shall be placed on their structural status in the soil and their functional relationships to absorption by plants.

Comparison of agronomic value of the insoluble nitrogen derived from Urea-Ammonia Liquor-37 and other sources, M. M. MCCOOL (*Contrib. Boyce Thompson Inst.*, 11 (1941), No. 6, pp. 393-401, fig. 1).—Slightly lower yields of millet grown in Norfolk fine sandy loam were obtained through the use of insoluble synthetic nitrogen formed from Urea-Ammonia Liquor-37 than were obtained where water-insoluble nitrogen was added in the form of cottonseed meal. Synthetic insoluble nitrogen was as available to millet, corn, and tomato plants when added to Gloucester loam as was cottonseed meal. Availability of Urea-Ammonia Liquor-37 was not altered by storing over a period of 8 weeks at a temperature of 110° F. The residual effect of insoluble nitrogen in Urea-Ammonia Liquor-37 was greater than it was in cottonseed meal. A comparison of the rate of nitrification of insoluble nitrogen from different sources revealed Urea-Ammonia Liquor-37 and cottonseed meal to be the most active. The temperature and time of storage did not affect the rate of nitrification.

Soil fertility as affected by soil nitrogen, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 45 (1941), No. 1, pp. 39-63, figs. 17).—The author discusses the development of our knowledge of soil fertility and stresses the importance of the application of the findings in research to agriculture. In studies on the effect of nitrogen fertilization, it was found that the season of the year had had a marked effect on the nitrogen response of *Panicum* grass. However, when there is a difference in response on soils to nitrogen tested during the same season of the year, it is evident that some other factor than seasonal effect must be responsible. Mitscherlich pot tests were used to determine the yield of *Panicum* grass from different soils. The results of the pot tests as well as additional studies on sugarcane in relation to nitrogen response are brought out. The author considers that differences in the yield of sugarcane obtained from various soils are related to soil-nitrogen supply. In order to obtain additional information on the nitrogen supply and on the intelligent use of nitrogen fertilizers, there is an indicated need for research on organic-matter decomposition and the effect of soil micro-organisms on soil conditions.

Soil organic matter and ion availability for plants, W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 6, pp. 487-494).—Soil organic matter is discussed in relation to its functions in plant nutrition. The behavior of organic matter in relation to ion mobility is considered to be both positive and negative. Break-down of the organic matter through the decay process may serve in a positive chemical way by contributing nutrient cations and anions to the plants. An opposite chemical effect may take place when the composition of the decaying compounds fails to serve as a well-balanced bacterial ration and compels the micro-organisms to withdraw ions from the soil solution or from the absorption complex and put into immobile form as insoluble microbial complexes many otherwise mobile ions. Soil organic-matter decay is considered in relation to decline of soil fertility. The author indicates the need for further thinking about the organic matter as a mobilizer of ions, since

other observations indicate that this factor is playing an important part. The organic matter of the soil is considered as the means of managing the fertility of the soil most wisely for its service to the future.

Physiological aspects of availability of nutrients for plant growth, D. R. HOAGLAND and D. I. ARNON. (Univ. Calif.). (*Soil Sci.*, 51 (1941), No. 6, pp. 431-444).—The authors discuss the following physiological processes involved in ion absorption: (1) The withdrawal of ions from soil solutions or artificial nutrient solutions, or perhaps directly from the surface of soil colloids, (2) accumulation of ions in root protoplasm or vacuoles and concomitant or subsequent movement of ions into the conducting system of the plant, and (3) upward movement and distribution of ions throughout the plant. The relation of oxygen supply and temperature to nutrient absorption is considered. Minor element supply is also important in relation to the deficient absorption of other ions. The authors point out that there are many factors which must be considered in any study of availability, and that there can be no one chemical criterion invoked in appraising the supplying power of all soils for a specific nutrient element. It is suggested by the authors that, even though empirical methods of appraising nutrient deficiencies in the soil may be devised for a particular soil-crop-climate system, there is need for further intensive study not only of the soil system but of the active role played by the plant as well.

Availability of ions in light sandy soils as affected by soil reaction, M. PECH. (Fla. Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 6, pp. 473-486, figs. 5).—The availability of ions in light sandy soils of low fertility in relation to fertilizers applied is influenced by the extent of leaching and fixation of the plant-nutrient supply. Solubility cannot be considered a good measure of availability. In determining availability, consideration should be given to the soil type. One of the more important properties of the soil in relation to fixation and leaching of fertilizer material is the reaction. Base-exchange capacity and exchangeable-base content of the surface layer supplies important information on treatments to be made to light soils. Correction of excessive acidity of light sandy soils by liming not only assures adequate supplies of available calcium and magnesium but also reduces leaching of cations, applied as soluble neutral salts, by favoring their absorption into exchangeable form, and thus tends to conserve the more valuable fertilizer constituents. However, the indiscriminate use of lime to raise the pH value of the soil to the point favorable to fixation of ions into nonexchangeable and nonavailable forms may offset any benefits derived from liming.

The balance of ions and oxygen tension in nutrient substrates for plants, J. W. SHIVE. (N. J. Expt. Stas.). (*Soil Sci.*, 51 (1941), No. 6, pp. 445-459, pl. 1, figs. 5).—General concepts concerning the balance of ions in nutrient substrates for plants are reviewed. Consideration is given to the importance of the balance of ions in determining the quality of the plant produced and of its products. The balance of ions for greatest effectiveness, however, is dependent upon the supply of oxygen. Oxygen tension was found to have a marked effect on the growth of soybean roots in culture solutions. The oxygen requirement of different species was found to vary greatly. Preliminary results are presented on the relation of oxygen tension to the absorption, accumulation, and assimilation of nitrogen by soybean plants. Organic acid content of plants was found to be highest at the lowest oxygen level.

Ion and plant relationships in western arid soils, O. C. MAGISTAD. (U. S. D. A.). (*Soil Sci.*, 51 (1941), No. 6, pp. 461-471, figs. 3).—Consideration is given to the soil characteristics and methods of formation of arid soils. The greatest problem under conditions of low rainfall obviously is the lack of moisture. In

addition to being essential for plant growth, moisture has a marked effect on the chemical and bacterial processes in the soil. The author points out the general chemical properties of the arid soils, with special emphasis on the fact that most of these soils are alkaline in reaction. The situation of element deficiencies associated with calcium carbonate and high pH values is revealed. Problems of maintaining organic matter and general conditions associated with soil salinity are discussed. The author points out the need for additional research on several problems related to the soils of the western regions.

The effect of non-legume green manure upon the fertility of forest nursery soils, W. H. BRENER and S. A. WILDE. (Wis. Expt. Sta.). (*Jour. Forestry*, 39 (1941), No. 5, pp. 478-482, fig. 1).—The effect of nonlegume green manure upon the growth and composition of 2-year-old red pines grown in sand cultures and upon fertility of sand cultures as determined by chemical analyses is reported. The chemical analysis of available nutrients combined with the growth data indicated that a considerable fraction of applied fertilizers is temporarily fixed as difficultly soluble organic compounds. These compounds, however, become gradually available in the course of organic-matter decomposition and stimulate the growth of nursery stock. The authors indicated that the practice of periodic rotations of nursery blocks with unfertilized nonlegumes as a transitional crop is not justifiable under Wisconsin conditions. However, the use of catch crops grown with the addition of commercial fertilizers is recommended in localities where peat or other absorbing materials are not available.

The effect of certain soil factors on the yield of wheat in the Punjab, R. C. HOON, C. L. DEHAWAN, and M. L. MADAN (*Soil Sci.*, 51 (1941), No. 5, pp. 339-349, figs. 12).—Results of a study of soils from various districts of the Punjab (India) to determine their contents of iron, manganese, phosphates, exchangeable sodium, potassium, calcium, magnesium, boron, nitrogen, total soluble salts, and pH values are given. A significant and negative correlation was found to exist between the manganese content of soils and the yield of wheat, while a significant and positive correlation was found between the phosphate content of soils and the yield.

Investigations into the absorption of phosphates in the soil and related manuring and liming problems [trans. title], O. FRANCK (*Modöbl. Centralanst. Försöksv. Jordbruksområdet [Sweden]*, No. 483 (1937), pp. 37, figs. 14, Eng. abs. pp. 36-37; abs. in *Amer. Fert.*, 95 (1941), Nos. 1, pp. 5-7, 22, 24, figs. 3; 2, pp. 10-11, 24, 26).—The retention of phosphoric acid by various soil types is considered. The amount of phosphorus retained was determined as water-soluble and lactate-soluble phosphoric acid. When phosphoric acid was added in the water-soluble form, less than 7 percent was retained in this form in very acid soils, between 7 and 10 percent in an almost neutral loamy soil, and between 14 and 20 percent in an alkaline sandy soil. Between 15 and 17 percent of the added water-soluble phosphoric acid remained in the lactate-soluble form in an acid silt loam, between 29 and 32 percent in an acid sandy soil, between 28 and 31 percent in an acid loam, and between 62 and 63 percent in an alkaline sandy loam. Studies on the development of the root system of oats and barley indicated that they were influenced by the method of applying phosphate fertilizer. Granulated superphosphate was found to be more effective than the pulverized form. Also phosphate fertilizer was more effective when worked down into the humus layer.

Phosphorus fixation by soil separates and fractions, A. T. PERKINS, C. A. WAGONER, and H. H. KING (*Amer. Fert.*, 94 (1941), No. 7, pp. 8, 24; abs. in *Amer. Chem. Soc. Mtg.*, 101 (1941), Abs. Papers, p. 23).—The fractions of Wabash soil were investigated to determine which parts were the most active in phosphorus fixation. It was found that phosphate fixation is increased as particle size

decreases. Among the coarser particles phosphate fixation was found to be greater by the light minerals than by the heavy minerals. The coarse particles are found to fix considerably more phosphate per surface area than the fine particles. The authors conclude that, in general, the larger the $R_2O_3 : SiO_2$ ratio the greater the phosphate fixation.

Sorption of potassium and ammonium by soils as influenced by concentration and the degree of base saturation, A. S. AYRES. (Hawaii Expt. Sta. coop. Hawaii. Sugar Planters' Expt. Sta.). (*Soil Sci.*, 51 (1941), No. 4, pp. 265-272, fig. 1).—For two Hawaiian clay soils, the sorption of potassium and ammonium as indicated from percolating solutions was found to decrease greatly with decreases in concentrations of the cations. Increasing the degree of calcium saturation of the soils increased the sorption of potassium and ammonium. Sorption of potassium and ammonium by the electro dialyzed soil was higher from the sulfates than from the chlorides of these cations.

The lime needs of some soils and crops, F. B. SMITH. (Univ. Fla.). (*Citrus Indus.*, 21 (1940), No. 11, pp. 12, 15).—The author discusses the general factors responsible for different degrees of acidity in soils, as well as the calcium and pH requirements for several crops and shrubs.

Drilling limestone for legumes, W. A. ALBRECHT (*Missouri Sta. Bul.* 429 (1941), pp. 20, figs. 13).—A general discussion is given of the value of drilling limestone for legumes as based upon experiments. Limestone is considered to be similar to a fertilizer, and thus it is important that the lime be incorporated in the soil so as to be in the region of contact of the growing plant. The importance of having lime available for the young seedling is considered. The form, purity, and degree of fineness of the limestone used are important factors in determining its effectiveness. Amount, seasons, and methods of drilling limestone for legumes are discussed, and the advantages and limitations of the practice are set forth.

The status of minor elements in Liebig's day and recent developments, L. G. WILLIS. (N. C. Expt. Sta.). (*Amer. Fert.*, 94 (1941), No. 7, pp. 5-7, 24, 26).—A review of Liebig's concept of plant nutrition is given. Several of the more important problems in relation to the development of the knowledge of importance of minor elements in plant nutrition are reviewed.

Fertilizer-placement machinery for southern crops, G. A. CUMINGS. (U. S. D. A.) (*Yearbook Com. Fert.*, 1941, pp. 40-48, figs. 19; also in *Com. Fert.*, 63 (1941), No. 2, pp. 8-12, 14-18, figs. 19).—Equipment for fertilizer placement for the more important agricultural crops of the South is described. Limitations and advantages of the various machines are discussed. The author stresses the importance of considering the condition of the soil or method of covering which may alter the position of the fertilizer. It is suggested that it is well to check in the field during application to determine if the fertilizer is placed as desired.

AGRICULTURAL BOTANY

[Botanical studies by the Massachusetts Station] (*Massachusetts Sta. Bul.* 378 (1941), pp. 34-35).—Brief reports, by L. H. Jones, G. E. O'Brien, B. Eames, C. A. Peters, and W. B. Shepardson, are given on studies of wilting due to changes in root temperature; negative results in photosynthetic stimulation by a proprietary eosinlike material; the effect of root media on root structure; and the nature of an oxidant produced by soybean plants in a nutrient solution.

[Botanical studies by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 37-39).—Brief reports are included on the relationship of glutamine and asparagine in spinach; and the availability of cations and anions on permutite and demineralite, respectively, in relation to the growth of red kidney beans.

[Abstracts of papers presented at National Academy of Sciences meeting] (*Science*, 93 (1941), No. 2419, pp. 436-438).—The following are of interest to botany: Genes in *Datura* which Induce Morphological Effects Resembling Those Due to Environment, by A. F. Blakeslee and A. G. Avery; Growth Regulation of Plants and Formative Effects Induced With β -Naphthoxyacetic acid, by P. W. Zimmerman; The Relative Position of Cell Walls in Developing Plant Tissues, by E. W. Sinnott and R. Bloch; and Biotin and the Growth of *Fusarium avenaceum*, by W. J. Robbins.

New United States grasses, J. R. SWALLEN. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 8, pp. 348-355, figs. 8).—Eight new species are described.

Storage and mounting of demonstration specimens, J. EHRLICH. (Univ. Idaho). (*Phytopathology*, 31 (1941), No. 8, pp. 763-765, fig. 1).—The cabinet units with grooved side walls described provide compact storage space for four interchangeable sizes of specimen drawers. Cabinet-width drawers are supported in the grooves by lateral projections of the drawer bottoms, and half-width drawers rest on removable shelves supported in the grooves. Methods of mounting dry demonstration specimens of various depths are also described and illustrated.

Designation of locations on maps and photographs, R. L. IVES (*Science*, 93 (1941), No. 2422, p. 523).—A method of "intersection" is presented in which, unlike two others referred to, by Reed (E. S. R., 84, p. 593) and Hubricht and Erickson (E. S. R., 85, p. 451), the designation remains unchanged regardless of reproduction on a scale differing from that of the original.

[Abstracts of papers on plant physiology] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 206-212).—The following papers are of interest to botany: Studies in Soil Relations of Species of Violets, by H. A. McCullough (pp. 206-207); Foliar Diagnosis and Plant Nutrition, by L. Burkhart (pp. 207-208) (N. C. Expt. Sta.); Comparative Nutrient Requirements for Several Types of Corn Seedlings, by C. L. Worley and E. L. Moore (pp. 208-209) (Univ. Ga.); Some Factors Affecting the Growth of Excised Cotton Roots, by C. Wilson (p. 209) (Ala. Polytech. Inst.); Vitamins in Peanuts, by J. G. Woodroof and T. A. Pickett (p. 209) (Ga. Sta.); Some Factors Affecting the Losses of Carotene in Hay, by O. E. Leonard (p. 210) (Miss Sta.); Effect of Day Length Upon the Vegetative Growth, Maturity, and Tuber Characters of the Irish Potato, by J. C. Miller and F. McGoldrick (p. 210) (La. State and Cornell Univ.); Extraction and Distribution of Soluble Minerals in the Peanut Plant, by N. R. Page and L. Burkhart (pp. 210-211), and Availability of Ions by the Soil Testing Method, by W. R. Hodgson and L. Burkhart (p. 211) (both Univ. N. C.); and Preliminary Work on Delayed Defoliation, by C. L. Worley and R. G. Grogan (pp. 211-212) (Univ. Ga.).

A biotin-like substance produced by *Diplodia zeae*, N. E. STEVENS and W. E. WILSON. (Univ. Ill.). (*Science*, 93 (1941), No. 2419, pp. 458-459).—A preliminary report.

A growth-depressant substance from yeast, E. S. COOK, C. W. KREKE, M. C. GIERSCHE, and M. P. SCHROEDER (*Science*, 93 (1941), No. 2426, pp. 616-617).—A previous communication (E. S. R., 85, p. 359) dealt with fractions from yeast antagonistic to the toxic action of germicides for certain molds and pointed out that growth-inhibitory substances were also present. Preliminary experiments here reported indicate that these materials can be concentrated.

Lack of inhibition of lateral buds by the growth-promoting substance phenylacetic acid, F. G. GUSTAFSON (*Plant Physiol.*, 16 (1941), No. 1, pp. 203-206, figs. 2). In experiments on *Helianthus annuus*, phenylacetic acid failed to sup-

press lateral bud growth, whereas indoleacetic and indolebutyric acids did so, the latter apparently being more effective than the former. A review of the literature indicated that in most of its effects on plant growth phenylacetic acid is less effective than the other two acids noted, though this is not true for parthenocarp. The author's results with respect to the behavior of phenylacetic acid in inducing gall formation but failing to inhibit lateral buds are presented for their bearing on the experimental study of bud inhibition.

Expression of hormone yields in relation to different *Avena* test methods, G. S. AVERY, JR., II. B. CREIGHTON, and B. SHALUCHA (*Amer. Jour. Bot.*, 28 (1941), No. 6, pp. 498-506).—In comparisons of the "deseeded" and "standard" *Avena* plant hormone test methods in terms of response to alcohol extracts of corn endosperms and embryos and to certain synthetic compounds, the methods proved about equally reliable statistically. The ratio of response of deseeded and standard oats test plants to endosperm extract was not the same as the ratio of their response to embryo extract, nor were either of these the same as their response to indoleacetic acid. Similarly, the ratio of response between these methods was not the same for any of the synthetic growth substances tested. It is thus clear that indoleacetic acid equivalents, as hormone units, are more restricted than was originally believed. For these reasons it is suggested that in *Avena* assays made in laboratories where there is little day-to-day variation, results might as well be expressed in simple, arbitrary units, an example of which is given. To attempt a further standardization of plant hormone units at present seems premature. It has been pointed out by others that it is the concentration rather than the absolute amount of growth substance in the agar block that determines coleoptile curvature in the *Avena* test. The authors' experiments confirm previous findings and show that uniform and consistent results are not always obtainable when small (2 mm.³) agar blocks are used. Larger ones (8 and 10 mm.³), on the other hand, gave consistent results in tests on hormone extracted from corn endosperm as well as in tests with indoleacetic acid. Curvatures did not differ significantly for any of the larger-sized blocks.

Elongation of mesocotyls and internodes in Job's-tears *Coix lachrymans* (L.), J. H. KEMPTON. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 6, pp. 261-263, fig. 1).—The failure of *Coix* to elongate the internode between the coleoptile and the bladeless sheath is suggestive that this sheath and the coleoptile are more intimately related in function than is the case with corn. The greater sensitivity of *Coix* to light, as compared with corn, and the extensive elongation of *Coix* mesocotyls, together with the close physical association of the coleoptile and bladeless sheath, suggests that both these latter organs produce the growth substance required for mesocotyl elongation.

Estimation, isolation, and identification of auxins in plant material, A. J. HAAGEN-SMIT, W. D. LEECH, and W. R. BERGEN (*Science*, 93 (1941), No. 2426, pp. 624-625).—Extraction at pH 10.5 from high- and low-protein wheat and corn meal.

Effects of vitamin B₁ on woody erosion-control plants, M. DONNELLY. (Calif. Citrus Expt. Sta. and U. S. D. A.). (*Science*, 94 (1941), No. 2429, pp. 71-72).—Of the nine plant species tested, no marked beneficial effects were found in the initial survival or initial growth rate by adding vitamin B₁ in water (0.05 mg. per liter of water) to the soil surrounding the plants. The survival data suggest that the added vitamin had, under the conditions, an adverse effect on the survival of some of the species tested.

The importance of microorganisms in vitamin research, R. J. WILLIAMS (*Science*, 93 (1941), No. 2418, pp. 412-414).—A general discussion, with the conclusion that the use of micro-organisms in the study of how vitamins function shows much promise.

Cytochrome oxidase in wheat embryos, A. H. BROWN and D. R. GODDARD (*Amer. Jour. Bot.*, 28 (1941), No. 4, pp. 319-324, fig. 1).—Extracts prepared from wheat embryos contained cytochrome oxidase as shown by cytochrome *c* stimulation of the catalytic oxidation of hydroquinone, *p*-phenylenediamine, and dihydroxyphenylalanine, and it was shown to be heat labile and inhibited by HCN, NaN₃, and CO with light reversal of the CO inhibition. A major fraction of the respiration of intact wheat embryos was similarly inhibited by these poisons with light reversal of the CO inhibition. It appears, therefore, that a major portion of the respiration is mediated by cytochrome oxidase. Clear evidence of the existence of cytochrome in wheat embryos was not obtained, though absorption bands were observed at 605 and 550 $m\mu$ corresponding to the α -bands of cytochromes *a* and *c*. The 550 $m\mu$ band disappeared on oxidation and reappeared on reduction. No direct evidence of the respiratory role of cytochrome in wheat embryos was obtained.

* **A foliar diagnosis study of the nutrition of greenhouse tomatoes in relation to the incidence of a disease**, W. THOMAS and W. B. MACK (*Pennsylvania Sta. Bul.* 405 (1941), pp. [1]+17, figs. 3).—In an experiment with greenhouse-grown differentially fertilized tomatoes, plants on certain plats receiving different combinations of commercial fertilizers without manure showed more or less marked symptoms of break-down characteristic of *Fusarium lycopersici* infection, whereas those on other plats, notably those with added manure, remained healthy. The foliar diagnoses of morphologically homologous leaves from plats having plants (1) severely diseased, (2) with slight symptoms, and (3) with no visible symptoms were compared with those of comparable leaves from vigorous and healthy plants from a plat treated with tertiary combinations of commercial fertilizers plus heavy applications of rotted manure, none of the plants of which showed evidence of disease. The intensity of nutrition with respect to the plastic elements, N, P, and K, was less in leaves from all types of plants from plats having diseased plants than in those from the plat on which all were healthy, and the lower the intensity of nutrition the greater was the onslaught of disease.

The physiological relationships between the plastic elements and also between the bases, Ca, Mg, and K, are shown in trilinear coordinates by means of the values for the composition of the NPK units and CaMgK units, respectively, in the sixteenth leaf. The coordinate points of the leaves of plants in two plats, one receiving muriate of potash plus sodium nitrate and superphosphate and the other muriate of potash plus superphosphate but without sodium nitrate, were displaced relative to the coordinate point of the vigorous, healthy plants receiving tertiary combinations of fertilizer plus manure and none of which became diseased. The displacement was higher towards the apex $N=100$ and further away from the right base apex $P_2O_5=100$ and also from the left base apex $K_2O=100$, indicating higher values for N and lower values for P_2O_5 and K_2O in the NPK unit. In the other diseased plat, receiving only sodium nitrate and superphosphate, the coordinate points of leaves from all types of plants were displaced relative to the coordinate point of the vigorous, healthy plants from the plat receiving all three elements together with manure, further away from the summit apex $N=100$ and also from the left base apex $K_2O=100$, but towards the right base apex $P_2O_5=100$, indicating lower values for N and also for K but higher values for P in the composition of the NPK unit. In the case of leaves from badly diseased plants of the plat receiving all three elements without manure, the advance of the disease resulted in a progressive decrease in the Ca of the CaMgK unit. Evidence that susceptibility to disease in these plants was related principally to nutritional disequilibrium between the plastic elements, N, P, and K, is given.

Soil moisture as a limiting factor for active absorption and root pressure, P. J. KRAMER (*Amer. Jour. Bot.*, 28 (1941), No. 6, pp. 446-451, figs. 5).—From exudation experiments with stumps of coleus, sunflower, and tomato, it appeared that about 45 percent of the soil moisture between the moisture equivalent and the wilting percentage, all of which is usable by intact plants, becomes unavailable to detopped root systems. The uniformity of results suggested that the soil moisture content limiting exudation is as characteristic of a particular soil as are the wilting percentage and the moisture equivalent. It was indicated that the active absorption mechanism responsible for root pressure and exudation fails to absorb against a diffusion pressure deficit greater than 1-2 atmospheres. It seems probable that root pressure is not developed in plants growing in soil containing less than about 45 percent of the moisture in the range from moisture equivalent to wilting percentage. It was also indicated that water probably is not equally available to plants over this range, but becomes less so with decreasing soil moisture. This is less important to intact plants than to detached root systems, because the passive absorption mechanism of the former can absorb water against a much higher diffusion pressure deficit than can detopped root systems.

Transpiration as influenced by osmotic concentration and cell permeability, T. S. BOON-LONG. (Cornell Univ.). (*Amer. Jour. Bot.*, 28 (1941), No. 4, pp. 333-343).—In a physical system, evaporation from open solutions is influenced by solutes to the same degree as the lowering of the vapor pressure gradient from the solution to the air, but with a collodion membrane between the solution and the air the rates of evaporation may be reduced more than ten times what would be indicated by the lowering of vapor pressure gradient. In a biological system, several treatments of plant parts increasing osmotic concentration of sap also resulted in a decrease in transpiration rates, with a direct introduction of glucose; exposure of leaves to light, or exposure to light plus a scalding of the petioles to prevent translocation; and, in a *Crassulaceous* plant, exclusion of light which resulted in breaking down compounds of high molecular weight into smaller molecules of organic acids.

High osmotic concentration induced by these methods lowered the permeability of the tissues to water as tested by a plasmolytic method. It seems clear that this lowering of permeability to water by high osmotic concentration is largely responsible for the reduction in transpiration rates. When the osmotic concentration was increased by lowering the temperature, however, hardened cabbage tissues transpired more rapidly than unhardened tissues. This increase in transpiration was associated with a marked increase in water permeability of the hardened tissues. Permeability of plant cells to water thus has an important effect on the rate of transpiration.

Dehydration injury and resistance, G. W. SCARF (*Plant Physiol.*, 16 (1941), No. 1, pp. 171-179, figs. 5).—Different kinds and conditions of plant material vary in a parallel manner in resistance to drought, frost, and plasmolysis, respectively. The maximum plasmolysis withstood by cells is determined by the point at which irreversible stiffening, presumably coagulation, of the ectoplasm occurs, and the immediate cause of death is usually the rupture of such ectoplasm on deplasmolysis. It is here suggested that a similar colloidal change follows a certain critical degree of dehydration when induced by frost or evaporation and that mechanical stresses may here also cause fatal rupture. In hardy cells the ectoplasm has a lower refractive index and a higher permeability than in less hardy cells. These differences point to greater hydration of the ectoplasm, and its most probable cause is a greater water-binding capacity of its colloids. The same colloidal difference may account for the greater resistance to coagulation through dehydration.

A study of dormancy in seeds of *Polygonum*, O. L. JUSTICE ([*New York Cornell Sta. Mem.* 235 (1941), pp. 43, figs. 8).—Seeds of the 21 species studied were dormant at maturity, and in most of these species seeds failed to germinate after dry storage at room temperatures for various periods of time. Dormancy in all species was broken by chilling the seeds at 2°–4° C. in water, in moist granulated peat moss, or between layers of moist cotton. The time required for afterripening varied with the species (2–8 weeks to 6 mo. or more). Afterripening proceeded more rapidly at a constant temperature range of 2°–4° than at 9°–11° or at alternating temperatures. Removal of the pericarp from achenes of many species decreased the time necessary for their afterripening at low temperatures. The pericarp exerts its influence primarily by restricting gas exchange, but also retards the rate of water absorption. Seeds of *P. scandens* stored in the presence of 1–16 percent CO₂ afterripened more rapidly than seeds stored with only a trace of this gas. High O₂ concentrations in which no CO₂ was present did not decrease the afterripening time. These results with intact seeds were in contrast to those with isolated embryos. Seeds of most species showed a decrease in afterripening time with increased age up to 18 mo. Seeds of many species which were approximately 28 mo. old or older gave low percentages of germination after chilling for 24, 48, 70, or 90 days. Seeds of most species studied germinated well after exposure to winter temperatures, but some apparently required more than one winter.

Embryos from dormant seeds of *P. scandens* did not grow into seedlings when placed on semisolid nutrient agar or in liquid nutrient solutions, but embryos on nutrient agar, by exposing them on nutrient agar to O₂ concentrations developed into vigorous seedlings when cultured on nutrient agar. Indoleacetic acid, indolebutyric acid, vitamin B₁, and a water extract of nondormant seeds did not induce germination of dormant embryos. Comparable results were obtained when germination tests with isolated embryos were made in darkness or in light. Dormancy in isolated embryos was overcome by chilling the embryos on nutrient agar, by exposing them on nutrient agar to O₂ concentrations of 50 percent or more for 7 days at 20°–23°, or by aerating them in a liquid nutrient solution at 20°–28°. Afterripening of embryos was not accompanied by an increase in size, but the process appeared to be a physiological one.

Seeds of the different species studied were physiologically similar in that all were dormant at maturity, afterripened at low temperatures, and showed a reduction in afterripening time on removal of the pericarp. They differed in the relative amounts of air and moisture necessary during afterripening, the duration of the afterripening period, and the temperatures at which it occurred. Species occurring in similar habitats or belonging to the same phylogenetic series did not consistently show a corresponding physiological behavior of their seeds. There are 37 references.

Respiration of citrus fruits in relation to metabolism of fungi.—I, Effects of emanations of *Penicillium digitatum* Sacc., on lemons, J. B. BIALE and A. D. SHEPHERD. (Univ. Calif.). (*Amer. Jour. Bot.*, 28 (1941), No. 4, pp. 263–270, figs. 6).—Using an apparatus described, the gaseous products of moldy lemons inoculated with *P. digitatum* caused a very marked increase in the rate of CO₂ evolution and accelerated color development in sound green lemons. Emanations of a single moldy lemon produced these effects in 500 fruits. Production of the active vapor by the fungus was favored by 14.5° C. Its formation was apparently not increased at 20° and 25°, but it was inhibited at 2.5°. These emanations were produced on a dextrose-potato broth-agar medium as well as by the moldy fruits, and a positive epinasty test resulted from their use on pea seedlings.

Differential inhibition of photochemical and dark reactions in photosynthesis by inorganic compounds, S. S. GREENFIELD (*Science*, 93 (1941), No. 2423, pp. 550-551, fig. 1).—Treatment of cells of *Chlorella vulgaris* with ZnSO_4 , NiSO_4 , or KCl was found to retard only the dark reactions of photosynthesis and this effect was strongest at high light intensities, whereas treatment with CuSO_4 , H_3BO_3 , KI , CoSO_4 , and $(\text{NH}_4)_2\text{SO}_4$ inhibited both the photochemical and the dark chemical reactions of photosynthesis over a wide range of light intensities. Since inorganic compounds are thus capable of differential inhibition of the reactions of photosynthesis, their use may provide new evidence on the mechanism of the process.

Effect of light on growth habit of plants, D. G. LANGHAM (*Science*, 93 (1941), No. 2424, pp. 576-577).—From experiments on nine plant species here reported and others to be published later, it is concluded that certain plants normally with prostrate growth habit under field conditions are probably negatively phototropic to intense light.

On the inhibition of the first internode of *Avena* by light, R. H. GOODWIN (*Amer. Jour. Bot.*, 28 (1941), No. 4, pp. 325-332, figs. 6).—Two distinct phases in the inhibition of elongation were distinguished, the first being characterized by high sensitivity to radiant energy and due to suppression of cell division and the second by a much lower sensitivity to radiant energy and due to reduction of cell elongation. The inhibitory wavelengths in the first phase ranged from the long ultraviolet to the long infrared, but the latter were very much less effective, and the extent to which cell division was inhibited by red light depended directly on the amount of radiant energy received by the plant. In the second phase wavelengths in the visible and to some extent in the short infrared portions of the spectrum were effective, but wavelengths longer than 16,000 \AA . had practically no effect on cell elongation at the intensities used. The radiant energy causing the inhibition may be received by the plant either below or above the coleoptilar node. When the tip alone was irradiated, inhibition was apparently indirect, the radiant energy inducing some chemical change in the coleoptile tip subsequently transmitted to the internode.

Root modifications induced in *Vicia faba* by irradiating dry seeds with soft X-rays, G. F. SMITH and H. KERSTEN (*Plant Physiol.*, 16 (1941), No. 1, pp. 159-170, figs. 10).—X-irradiation of unsoaked seeds resulted in a general failure of lateral root formation, an apparent poor development of the root tip as compared with controls, and "delayed killing" in the roots becoming evident after an 8-day germination period. In the germinating irradiated seeds the root meristem, the beginning of root elongation, and the first occurrence of vascular cells appeared within a span of about 0.6-0.7 mm. from the root tip, whereas these developments appeared over a region of about 5-6 mm. in control seedlings. In the upper limits of the primary root, the primary xylem tissues in the irradiated sections appeared as a continuous band surrounded by a region of poorly differentiated cells, comparable in the controls to phloem, pericyclar, cambial, and endodermal areas. Cambial activity was indicated only at points opposite the primary xylem arcs, where a small band of large xylem cells occurred which might have been secondary xylem. The degeneration of cells normally retaining their ability to divide was readily observed in the root tip meristem, in the probable cambium region, and in the region where lateral roots are normally initiated in the pericycle. Secondary vascular cells were not observed in the hypocotyl, in which small groups of primary spiral xylem cells appeared at intervals internal to a region of cells which might have been poorly differentiated phloem. A schizogenous cavity was

consistently and characteristically present in the pith region of the hypocotyl of seedlings grown from the irradiated seeds when root growth permanently ceased.

Effect of temperature during irradiation on the X-ray sensitivity of maize seed, J. H. KEMPTON and L. R. MAXWELL (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 10, pp. 603-618, figs. 3).—Repeated tests consistently indicated that the X-ray sensitivity of air-dry (8 percent moisture) corn seeds depends on their temperature during irradiation. Within the temperature range used (-187° to 66° C.), maximum sensitivity occurred from 0° to room temperature. Increases or decreases from these values resulted in a reduction of the X-ray sensitivity.

GENETICS

The diploid cell and the diploidisation process in plants and animals, with special reference to the higher fungi, I, II, A. H. R. BULLER (Bot. Rev., 7 (1941), No. 7, pp. 335-387, 8, pp. 389-431).—A critical monographic summary of present knowledge, with eight pages of references.

The minor coil in meiotic chromosomes and associated phenomena as revealed by the Feulgen technique, L. C. COLEMAN and B. R. HILLARY (Amer. Jour. Bot., 28 (1941), No. 6, pp. 464-469, figs. 9).—Methods previously in use for making permanent preparations for the study of chromosome structure are examined and criticized.

Inheritance of smut resistance in some oat hybrids, G. M. REED (Amer. Jour. Bot., 28 (1941), No. 6, pp. 451-457).—In three oats hybrids studied one parent was resistant and the other susceptible to race 1 of loose smut (*Ustilago avenae*), and the inheritance of resistance seemed to depend on one factor. In one hybrid the parental varieties differed in reaction to race 1 of this smut and in another to race 3, and in both of these hybrids a single factor for resistance appeared to be involved. In two hybrids both parents were very susceptible to race 1 of loose smut, and the various hybrid generations inoculated seemed to be as susceptible as the parents. In two hybrids both parents were resistant to race 1 of covered smut (*U. levis*). In one hybrid the F_2 and F_3 showed complete resistance, whereas three factors for inheritance of resistance seemed to be involved in the other. The parental varieties of hybrid No. 87 showed a contrasting reaction to race 1 of loose smut and to race 3 of covered smut. Resistance to each smut appeared to depend on a single factor, the factors being independent.

[Papers on animal genetics presented before the Genetics Society of America at the 1940 meetings in Philadelphia, Pa.] (*Genetics*, 26 (1941), No. 1, pp. 142-175; also in *Genet. Soc. Amer. Rec.*, 9 (1940), pp. 142-175).—The usual brief abstracts (*E. S. R.*, 82, p. 610) are presented of the following papers: Inheritance of Plumage Color in *Phasianus colchicus*, by J. H. Bruckner (p. 142) (Cornell Univ.); The Incidence of Methylcholanthrene Induced Tumors in Inbred Strains of Mice, by W. J. Burdette and L. C. Strong (p. 143); Genetics and Embryology of an Anophthalmic Strain of Mice, by H. B. Chase (p. 144) (Univ. Ill.); The Genetics of Spontaneous Mouse Leukemia, by R. K. Cole and J. Furth (pp. 145-146) (Cornell Univ.); Immunogenetic Studies of Serum Proteins Following a Species Cross in Doves, by R. W. Cumley and M. R. Irwin (pp. 146-147) (Univ. Wis.); Comparable Interaction of Hereditary Factors From "Wild" and "Domesticated" Populations in Intraspecific and Intergeneric Crosses of Fishes, by M. Gordon (p. 153); Coat Color Inheritance in Bullterriers, by N. Kaliss and L. C. Briggs (pp. 156-157); A Second

Back-cross Test for Determiners of Spontaneous Leukemia, by E. C. MacDowell, J. S. Potter, M. J. Taylor, and E. N. Ward (p. 160); More or Less Lethal Genes, by R. K. Nabours (pp. 162-163) (Kans. Expt. Sta.); Some Internal Morphological Variations and Their Relation to Adult Body Size in the Rabbit, by P. B. Sawin and C. W. McNutt (pp. 166-167); Linkage Studies With Induced Translocations in Mice, by G. D. Snell (p. 169); Hereditary Variations in the Abundance of Parafollicular Cells of the Thyroid Gland of the Dog, by E. M. Vicari (p. 173) (Ohio State Univ.); and Interaction of the Genetic Constitutions of Host and Pathogen in Mouse Typhoid, by M. R. Zelle and J. W. Gowen (pp. 174-175) (Iowa State Col.).

[Genetic studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 11-12, 13, 20-21*).—Reports are presented on the following studies: Delayed conception and sterility in heifers, types of western ewes for Kentucky, and the effect of relative humidity on hatchability of turkey eggs.

Statistical analysis of black colour in Wessex saddleback breed, T. M. OLBRYCHT (*Ann. Eugenics, 11 (1941), No. 1, pp. 80-88*).—A statistical analysis of the frequency of occurrence of blacks in 287 litters recorded in the Wessex saddleback herdbook showed that more than a single recessive gene was responsible for the solid color. The frequency of occurrence of blacks in litters of heterozygous parents was greater than expectation when large and small numbers of blacks were present, but less than expected in litters of from three to five black pigs. Failure to decrease the occurrence of blacks in successive generations and the production of belted pigs by all-black parents suggest the operation of multiple factors (polygenic) modifying the size of the belt. Part of these modifying genes decreased the width of the belt and part increased it. Thus the different types of belting and nonbelting appear in successive generations even after selection for a uniform belt. The heterogeneity of the proportion of black in different litters is considered to demonstrate that all blacks may differ genotypically from each other.

The inheritance of three coat color mutations in ranch-raised minks, S. E. SMITH, C. H. WHITAKER, L. F. DAVIDS, and P. V. NOBLE. (U. S. D. A., Cornell Univ., et al.). (*Jour. Hered., 32 (1941), No. 5, pp. 173-176, figs. 2*).—The coat color of three mutations from wild type with dark chocolate-brown guard hairs and blue-gray underfur is described. The mutations involved platinum (*p*), and blond (*b*), which were inherited as autosomal recessives to the normal, and silver (*S*), which behaved as an autosomal dominant. The ratios produced in crosses with the normal gave relatively good fit to expectation. No silvers were mated, consequently no homozygous silvers were produced.

Linkage studies of the rat (*Rattus norvegicus*), IV, W. E. CASTLE, H. D. KING, and A. L. DANIELS. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc., 27 (1941), No. 6, pp. 250-254*).—Continuing this series (E. S. R., 84, p. 606), a mutation occurring in the rat colony of Daniels was described as "wobbly." It involved a lack of coordination which was not caused by feeding manganese or manganese-fluorine diets. Wobbly behaved as a simple recessive. The gene was found to be in chromosome III, with a cross-over percentage between wobbly and hairless of 40.3 ± 3.1 . Essentially equal numbers were produced in cross-over and noncross-over groups involving several chromosome markers except between wobbly and hairless, in which there occurred 71 noncross-over to 48 cross-over progeny.

Correlation and body proportions in mature mice of the genus *Peromyscus*, F. H. CLARK (*Genetics, 26 (1941), No. 3, pp. 283-300*).—Correlations and ratios between body measurements of three species and several subspecies

of the genus *Peromyscus* showed that marked differences between body proportions existed. General size factors of a genetic nature caused differences in the tail, body, foot, femur, mandible, skull, and condyle-zygoma. Body size and proportion in *Peromyscus* cannot be attributed entirely to general size factors and heterogonic growth. Thus, special size factors (genetic and environmental) appear to be responsible for a large part of the differences.

Genetics of the fowl.—XIII, Breed differences in susceptibility to *Salmonella pullorum*, F. B. HUTT and J. C. SCHOLES. (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 342-352, figs. 2).—Continuing this series (E. S. R., 85, p. 329), the authors found that the tendency of White Leghorns to be more resistant to *S. pullorum* than the heavier breeds was independent of the factor *I*, which inhibits melanin color and therefore causes white. In addition, in official testing in several States, reactors were found less frequently in White Leghorns than in other breeds. The mortality was less in White Leghorns than in Rhode Island Reds and Plymouth Rocks as a result of definite inoculation and by natural infection. It was found that the progeny of heterozygous white ♂s × black ♀s showed no significant differences in the mortality of the black and white chicks following inoculation. Strains that had been exposed and were therefore partly culled of susceptible birds showed greater resistance by the lesser occurrence of the disease.

Studies of resistance to pullorum disease in chickens, H. M. DeVOLT, G. D. QUIGLEY, and T. C. BYERLY. (Univ. Md.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 339-341).—A study of susceptibility of different strains of chickens to pullorum disease showed that relatively resistant strains may be developed by selection. Pullorum-clean flocks which had not been previously exposed to the disease gave a survival, after inoculation, of only 8.7 percent, whereas 30.8 percent survived from flocks containing reactor birds. This was similar to 32.5 percent found for birds from the Illinois pullorum-resistant flock.

Sex determination of day-old chicks.—II, Type variations, T. H. CANFIELD. (Minn. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 327-328, fig. 1).—Continuing this series (E. S. R., 83, p. 611), type variations in the ♂ and ♀ eminences encountered in sexing day-old chicks are described and illustrated as experienced under different degrees of pressure. The frequency of different basic types found in 10,000 chicks is noted.

Auto-sex linkage in the domestic fowl.—II, Auto-sexing accuracy with the gene for barred feathers in red to black down-color phenotypes, R. G. JAPP. (Okla. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 317-321).—In continuation of this series (E. S. R., 84, p. 607), a stock bred for determination of the presence of one or two barring genes at hatching was found to vary from creamy white, buff or yellow, red to black, and various patterns resulting from the quantity and distribution of yellow and black pigment involved. These were roughly divided into three phenotypic groups—red, striped, and mahogany. In the red group, chicks with two barring genes were lighter in color than their full sisters. The ♂s had definite head spots, and the dorsal surface appeared light and silvery. Sexing was positive in 75 percent of the progeny, and, with experience, a 97 percent accuracy could be attained. The ♂ chicks of the striped group exhibited a light head spot and silvery stripes along the dorsal surface. Sex identification in this group was positive. In 77.1 percent of the mahogany group, ♂s had a light head spot and silvery stripes on the back, while ♀s were either uniformly plain or were light mahogany with light-brown stripes on the back. Sex identification was positive. It was, however, necessary to discard 22.9 percent before perfect sex separation was possible. These conclusions were based on observations on 1,444 individuals.

Phospholipids as a source of energy for motility of spermatozoa, H. A. LARDY and P. H. PHILLIPS. (Univ. Wis.). (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. LXXXIV-LXXV).—Egg lecithin decreased respiration and greatly prolonged the motility of bull spermatozoa suspended in a Ringer phosphate medium. The decrease in O_2 consumption coincided with the decrease in motility. Phospholipids from rat liver, lecithin from soybeans, and cephalin from soybeans or egg yolk were utilized by bull spermatozoa.

Recent research developments in the preservation and handling of bovine semen, G. W. SALISBURY. (Cornell Univ.). (*Cornell Vet.*, 31 (1941), No. 2, pp. 149-159).—An account is given of the most recent developments in bovine artificial insemination and the more approved practices employed in collecting and preserving bull semen.

Chick comb method for androgen assay, R. T. FRANK, F. HOLLANDER, and E. KLEMPNER (*Endocrinology*, 28 (1941), No. 6, pp. 1003-1004).—Brief reference is made to proposals of others for androgen assay, with the suggestion that final judgment of the chick comb method be reserved since it is less cumbersome and expensive than the capon test.

The liver and the adrenal androgen of the rat, M. W. BURRILL and R. R. GREENE (*Endocrinology*, 28 (1941), No. 6, pp. 874-876).—Gross weight and histological findings indicated that the adrenal androgen of the rat was not inactivated by the liver (E. S. R., 84, p. 174). These conclusions were based on the prostate weights in immature castrated ♂ rats in which the adrenal circulation was passed through the liver, as contrasted with complete adrenal removal. Histological study of the prostates confirmed these findings.

Androgen production in the female rat: The ovary and the adrenal in the immature rat, M. W. BURRILL and R. R. GREENE (*Endocrinology*, 28 (1941), No. 6, pp. 871-873).—The ovary was found to produce sufficient androgen to stimulate growth of the ♀ prostate in immature ♀ rats up to 26 days of age. Following castration, the production of androgen was partly assumed by the adrenal. The results were obtained by determination of the prostate weight of ♀s castrated and adrenalectomized in comparison with normals. Histological findings confirmed the gross weight determinations.

Experimental intersexuality: The effects of combined estrogens and androgens on the embryonic sexual development of the rat, R. R. GREENE, M. W. BURRILL, and A. C. IVY (*Jour. Expt. Zool.*, 87 (1941), No. 2, pp. 211-232).—Continuing these studies (E. S. R. 84, p. 750), daily injections of oestrogens and androgens into pregnant ♀s from the fourteenth to the twenty-first day of gestation showed that the sex hormones were mutually antagonistic in their effect on embryonic sexual development. "When given in sufficient amounts, the androgens completely nullify the oestrogen effects on the ♂ and the oestrogens completely nullify the androgen effects on the ♀." Androgens seemed to be more potent than oestrogens. The investigations dealt with 96 ♂s and 92 ♀s.

Influence of testosterone propionate on somatic growth in the white rat, H. SHAY, J. GERSHON-COHEN, K. PASCHKIS, and S. S. FELS (*Endocrinology*, 28 (1941), No. 6, pp. 877-884, figs. 7).—Rats treated with 1 mg. of testosterone propionate three times per week showed no significant differences in growth rate over controls, but after from 6 to 7 weeks of treatment the ♀s grew more rapidly. The attempts to stimulate more rapid early growth of ♀s by daily treatment with 5 mg. of testosterone propionate were unsuccessful, and continuing this treatment for 6-7 weeks seemed to impair the growth rate. The hormone treatment of ♀s produced large ovarian tumors which were considered, in part, responsible for the increased weight. The pituitaries of hormone-treated rats

were not as heavy as normals, resulting in inhibition of the output of pituitary gonadotropic hormone thus developing from the effects produced by oestrogen, at least as far as follicle-stimulating hormone is concerned.

Production of heat and ovulation in the anestrus ewe, T. D. BELL, L. E. CASIDA, G. BOHSTEDT, and A. E. DARLOW. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 10, pp. 619-625, fig. 1).—Ovulation without heat was produced by injection of pregnant-mare serum or sheep anterior pituitary extract in anoestrous ewes. The production of heat by Progynon-B was uniformly successful. In conducting these studies, 30 yearling ewes were employed with injections, singly and in combination, of the gonadotropic extracts, and daily vaginal smears were made. The ewes were exposed to an aproned ram for the determination of willingness to mate.

Histological effects of injecting residual ovarian extracts, F. GROETSEMAN and H. W. MARLOW. (Kans. State Col.). (*Endocrinology*, 28 (1941), No. 6, pp. 1001-1003).—Histological study of the ovaries of the immature rat from the previous study (E. S. R., 75, p. 34) following injection of ovarian extract for from 10 to 20 days seemed to indicate the presence of some other active substance than oestrogen which has its effect through the hypophysis. There was greater follicular development in experimental animals than in the controls.

Effectiveness of various methods of sex hormone administration for the induction of heat in the spayed female guinea pig and rat, A. L. SODERWALL and R. J. BLANDAU (*Endocrinology*, 28 (1941), No. 6, pp. 1004-1006).—Comparison of the rat and guinea pig as to their response to different methods of hormone administration showed that spayed ♂ guinea pigs required considerably smaller doses of progesterone, Progynon-B, or pregnenolone to induce heat than were required by the rat, regardless of the form of administration. Subcutaneous injection was more effective, with larger doses required by the percutaneous method. The least effectiveness was produced by oral administration.

Inhibition of the pseudopregnancy reaction in rabbits with estrogenic and androgenic hormones, B. ZONDEK and J. SKLOW (*Endocrinology*, 28 (1941), No. 6, pp. 923-925).—Follicle rupture and pseudopregnancy reaction following electrical stimulation in the rabbit were inhibited by the administration of 0.5 mg. of oestradiol benzoate or 10 mg. of testosterone propionate over a 5-day period. When the oestrogen or androgen was not given, pseudopregnancy changes were observed on the sixth day at autopsy. The electrical stimulation caused pseudopregnancy only during the months of January to June, although it was induced by coitus at any time during the year. This suggests the action of some unknown factor in the rabbit following coitus.

The germ cells of the rabbit ovary from sex differentiation to maturity, K. L. DUKE (*Jour. Morphol.*, 69 (1941), No. 1, pp. 51-81, pls. 6).—In a histological study of germ cell formation in the rabbit ovary from 17 days of gestation to 138 days after birth there were definite signs of oogenesis from the germinal epithelium for from 35 to 90 days after birth. A marked increase in the number of oocytes occurred at 60 days. Continuous or at least periodic activity of the germinal epithelium caused production of new ova up to sexual maturity.

FIELD CROPS

[Research with field crops in Idaho, 1940]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul.* 239 (1941), pp. 27-31, 34-36, 65-69, 71-75, 76-78, figs. 8).—Experiments with field crops at the station and substations (E. S. R., 84, p. 319), for which brief progress reports are given by K. H. Klages, C. A. Michels, C. I. Seely, C. F. Dietz, J. L. Toevs, L. Smith, R. F. Johnson, R. E. Knight,

and W. A. Moss, included breeding work with wheat, oats, and corn; variety tests with winter and spring wheat, oats, corn (and hybrids), alfalfa, potatoes, grain sorghum, sorgo, forage grasses, and pasture mixtures; effects of seeding rates on seed yields of smooth brome grass, a sod-former, and crested wheatgrass, a non-sod-forming grass; seed yields of different grasses when fall-sown with double disk drill on summer fallow and spring-sown on summer fallow with press drill (beet drill); seedings of grasses and legumes on burned-over land; the relationship of wheat yields to precipitation; fertilizer trials with alfalfa, potatoes, and pastures; use of borax to remedy B deficiency of alfalfa; influence of soil management and crop rotation practices on yields of wheat and potatoes; hastening maturity of potato tubers by killing vines with ammonium sulfate sprays; control of bindweed by continuous cultivation; and utilization of alkali weed, *Bassia hyssopifolia*, for sheep pasture. The merits of Elgin wheat and Marida oats (Markton \times Idamine) are also noted.

Progress report of soils and crops experiments on the Knox County Experiment Field from 1936-1940, A. T. WIANCKO, G. P. WALKER, and C. LETT (*Indiana Sta. Cir. 264* (1941), pp. 4).—Progress results for the period are tabulated and discussed from work including variety tests with wheat, oats, soybeans, and winter barley and rye; comparisons of manure and commercial N carriers as top dressings for wheat and of different N treatments for corn in a 2-yr. rotation of corn and wheat with an intercrop of sweetclover and lespedeza seeded in the wheat; effects of lime, manure, and fertilizers applied in a rotation of corn, with rye and vetch for winter cover, soybeans, wheat, and mixed hay on soil fertility; crop rotations; and pasture fertilization. Practices are recommended for the management of the kind of land on the field, i. e., largely Alford silt loam with a little Muren silt loam on the more level areas.

[Field crops research in Kentucky]. (Partly coop. U. S. D. A.). (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 22-29, 29-31, 32-33, 37-40, 55, 56-58, 59, 60-61*).—Work with field crops at the station and substations (E. S. R., 83, p. 479) for which brief progress reports are given, included tobacco investigations embracing fertilizer tests at the soil experiment fields, effect of excessive applications of manure and fertilizers on germination of seed and growth of seedlings, relationship between available N supply and yield and quality of Burley tobacco, priming the lower leaves, effects of time of cutting following a drought, and splitting v. spearing, all with Burley tobacco, curing experiments with Burley and dark tobacco, coke v. sawdust and wood for curing dark tobacco, and injury to leaves after curing; crop fertilization studies on responses of corn, wheat, and hay in rotation to manure, limestone, and phosphate, and residual effects of limestone and phosphates on these crops; residual effects of legumes used as the third-year crop in rotation with corn and wheat; effect of calcium carbonate used with rock phosphate on yield of wheat; effectiveness of manure in preventing K deficiency; effect of K and N on crop yields; rate of liming in conjunction with rock phosphate; effect of season on chemical composition of corn plants; tests of Kentucky bluegrass and other grasses in mixtures, especially for the effects of Korean lespedeza; a study of flowering of red clover varieties; germination, seed setting, and N fertilizer tests with Kentucky bluegrass; response of pasture to fertilizer treatment; fertilizer and variety tests with sorgo for sirup; breeding work with corn and hybrids, red clover, a slow-germinating strain of crimson clover, and orchard grass; and variety tests with corn and hybrids, red clover, alfalfa, timothy, and castor-beans.

[Agronomic work by the Fruit and Truck Station] (*Louisiana Sta., Fruit and Truck Sta. Bion. Rpt. 1939-40, pp. 17-18, 20-21, 23, 24, 40-42*).—The progress

of variety tests with potatoes, winter legumes, and sugarcane; fertilizer studies with lespedeza and hairy vetch; effects of fertilizers on yields and mineral content of hay from a native grass plus clover meadow; a liming test with common vetch; inoculation studies with hairy vetch and soybeans and a production trial with Alyceclover (E. S. R., 84, p. 324) are again (E. S. R., 81, p. 639) reported on by W. F. Wilson, jr., and D. M. Seath.

[Field crops work by the North Louisiana Substation]. (Partly coop. U. S. D. A.). (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1939-40, pp. 6-21, 24-26, 27-28, 32-34, 41-43*).—The average results during different periods are reported by D. M. Johns and D. M. Seath from experiments with field crops (E. S. R., 81, p. 639), including variety tests with cotton, corn (and hybrids), cowpeas, soybeans, peanuts, crotonaria, lespedeza, sugarcane for sirup, grain sorghum, potatoes, and sweetpotatoes; fertilizer trials with cotton, corn, alfalfa, potatoes, and sweetpotatoes; influence of vetch and fertilizer treatments on the yield of grain sorghum; seedbed preparation and planting tests with cotton and corn; spacing tests with corn and interplanted soybeans; comparisons of winter cover crops for cotton and corn; effects of grazing by dairy cattle on production of sweetpotatoes; improvement of pastures by fertilizers and manure; and effects of P fertilizers on P content of hay. Crops and Soils Outfield Work in the Hill Land Area of North Louisiana, by H. B. Brown (pp. 41-43), summarizes some of the more important results in agronomic work in the section, especially on growing Austrian Winter peas or vetch for cover crops, cotton fertilizers, and cotton and corn varieties.

[Research with rice and other crops in Louisiana, 1939-40] (*Louisiana Sta., Rice Sta. Bien. Rpt. 1939-40, pp. 5-24, 33-34*).—Rice experiments (E. S. R., 81, p. 639), reviewed by J. M. Jenkins for 1939 and 1940, comprised variety, fertilizer, and date and manner of submergence tests; rice rotations and continuous planting; 2-yr. rotations to determine the effect of Italian ryegrass and the residual effect of calcium arsenate on the yield of rice; and studies of the effect of holding water on rice lands in alternate years when not sown to rice. Advances Toward New and Improved Rice Varieties, a special article by N. E. Jodon (pp. 20-24) (coop. U. S. D. A.), reviews progress and accomplishments in breeding work, and Sulphur Studies, by T. C. Ryker and M. B. Sturgis (pp. 33-34), describes the response of Blue Rose rice to S applications. Experiments with other crops included variety tests with cotton, grain sorghum, and sorgo; fertilizer tests with cotton; a cotton and corn rotation; and permanent pasture studies.

[Field crops research in Massachusetts] (*Massachusetts Sta. Bul. 378 (1941), pp. 10-11, 13-14, 15-17, 18, 46-47, 56, figs. 2*).—Progress results are reported again (E. S. R., 83, p. 759) by W. S. Eisenmenger, K. J. Kucinski, J. W. Hurdie, W. G. Colby, H. M. Yegian, R. W. Donaldson, and C. E. Cross from studies on the effects of preceding crop and weed plants on yield and quality of tobacco, the composition of such plants in several growth stages, particularly in lignin, and the influence of preceding plants of high lignin content on brown root rot of tobacco; fertilizer and planting tests with sunflowers for seed and a production and ensiling test; strain tests with hay and pasture plants, including timothy, orchard grass, meadow fescue, perennial ryegrass, and red clover; the relative value of three varieties of ryegrass as green manure and winter cover crops following onions; a variety test with potatoes; borax studies, including effects of 25-lb. per acre top dressings on field stands, deficiency symptoms on alfalfa plats receiving potassium chloride, and effects of from 20- to 50-lb. applications at planting on alfalfa and Ladino clover; and control of weeds and shrubs of cranberry bogs by various chemicals.

Field-crop experiments at the Conservancy District Substation, 1938-1940. R. STROUD (*New Mexico Sta. Bul.* 279 (1941), pp. 24, figs. 6).—Experiments with field crops under irrigation at the new substation near Albuquerque included variety tests with spring and winter wheat and barley, oats, corn (and hybrids), grain sorghum, sorgo, sugar beets, alfalfa, cotton, soybeans for hay and seed, cowpeas, mung beans, clover, and tobacco; production tests with safflower, pinto beans, and flax; fertilizer tests with sugar beets for seed production and alfalfa; and control of bindweed by chemicals and cultural methods.

Varieties outstanding in the tests included Thatcher spring wheat; Trebi spring barley; Tennessee Winter, California Feed, and G2318 winter barley; Texas Red and Colorado 37 oats; Golden June and Red June corn and certain lowwealth corn hybrids; Atlas sorgo; Argentine, Hairy Peruvian, and New Mexico common alfalfa; and Laredo soybeans.

Results indicated that a satisfactory yield of beets for sugar, with a good sugar content, could be obtained by planting a variety resistant to curly top. Sugar beets probably would not be grown for sugar in the Conservancy District commercially in the near future because of economic factors. Sugar beets planted late in August or early in September could produce a seed crop successfully in the area. A nitrogenous fertilizer applied in spring has greatly increased the seed yields. The response of alfalfa to superphosphates recommends their application. Under present conditions, cotton growing is not advised for the section. The most practicable control method for bindweed appeared to be a combination of smother crops and cultivations, including exposure of the bindweed roots during winter.

[**Agronomic studies in Rhode Island**]. (Partly coop. U. S. D. A. et al.). (*Rhode Island Sta. Rpt.* [1940], pp. 2, 8-18, 19-20, 25-28, 29-30, 30-31, 40-42).—Brief reports of progress are made again (E. S. R., 84, p. 34) from variety tests with corn, potatoes, and lawn and turf grasses; fertilizer experiments with potatoes, mangels, rutabagas, onions, cabbage, millet, and lawn and turf grasses, particularly varieties and strains of bents; planting, spraying, fertilizer, and pH range tests with potatoes; residual effects from different levels of fertilizer, as shown by yields of Japanese millet; effects of crops on succeeding crops, involving liming, B, and soil sterilization by steaming and with chloropicrin; B deficiency in root crops; crop rotations; root development of pasture grasses and their responses to different lengths of day; a study of proliferation in timothy, Colonial bent, and orchard grass; breeding work with bentgrasses and alfalfa; control of lawn weeds; endurance of grasses and grass mixtures on an athletic field; seed production of bentgrass varieties and strains, especially in response to fertilizer treatments; effects of seed treatments of Rhode Island bent and Kentucky bluegrass with various phytohormone dusts, commercial preparations, and talc on germination, growth, development, and disease resistance on fertilized and unfertilized plats; a test of compost for bentgrasses; and comparisons of Sudan grass, millet, oats, and winter rye and wheat for supplementary pasture.

Summer fallow in Kansas. R. I. THROCKMORTON and H. E. MYERS. (Coop. U. S. D. A.). (*Kansas Sta. Bul.* 293 (1941), pp. 30, figs. 8).—The value and use of the practice of summer fallowing are described from extensive experiments by the station and the Department (largely reported earlier), with particular reference to conditions in western Kansas. Information, usually with pertinent data, is given on soil moisture in crop production, especially winter wheat; the influence of seedbed preparation on moisture storage; the relation of soil moisture in the soil at planting time to sorghum yields; fallow methods for wheat, sorghum, barley, oats, and corn; effects of fallow on yields of wheat

and sorghum and on frequency of wheat failure; wide spacing of row crops v. fallow; effects of soil type on the value of fallow and effects of fallow on losses of soil fertility; and the place of fallow in the cropping system.

Factors affecting the germination of various dropseed grasses (*Sporobolus* spp.), V. K. TOOLE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 12, pp. 691-715).—Studies were made of optimum conditions for germination of seven species of *Sporobolus*, of the variability of germinating power within the species, and of some special treatments, as sulfuric acid or prechilling, for overcoming the resistance of certain species to germination. Of the species studied, *S. airoides*, *S. wrightii*, *S. asper*, and samples of *S. cryptandrus* from Colorado, Oklahoma, Washington, Utah, and Kansas germinated readily at a suitable temperature alternation, e. g., room temperature to 35° C., although in some cases the addition of light and K nitrate was necessary for maximum germination. On the other hand, *S. flexuosus*, *S. contractus*, *S. giganteus*, and samples of *S. cryptandrus* from Texas, Arizona, Nebraska, and Wyoming gave very low germination at a wide range of constant and alternating temperatures, and nitrate and light had little or no effect. Further treatment was necessary for best germination. The seed of resistant samples germinated readily after treatment with approximately 71-percent sulfuric acid when supplied with optimum conditions for germination. For the resistant species, prechilling at 3° for from 2 to 4 weeks brought about maximum germination with some samples, but treatment with sulfuric acid was superior with most samples. The nonresistant samples were benefited by prechilling only when the seed was fresh. Germination of the species studied is rapid if all requirements for germination are supplied. Nonresistant species have completed germination in from 14 to 21 days. The seed coat of the species studied did not prevent the absorption of water.

Sedges, rushes, and other grass-like plants, O. A. STEVENS (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 6, pp. 12-15, figs. 5).—The occurrence, and in some cases the economic importance, of a number of sedges, rushes, and other grass-like plants in North Dakota is described briefly.

Tests show winter barley non-hardy, J. F. BRANDON and D. W. ROBERTSON. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 3, p. 13).—Recent tests at Akron have not revealed that any new varieties or selections of winter barley are appreciably hardier than Tennessee Winter, which in earlier tests of the field station averaged 12.4 bu. per acre v. 23.9 bu. for Hannuchen, the spring variety recommended at that time. In only 1941 of the last 3 yr. has a stand of winter barley survived enough to permit a yield comparison with spring-planted barley. During the two preceding winters, winter wheat was surviving normally and spring barleys were returning creditable yields.

Experiments with buckwheat, J. W. WHITE, F. J. HOLBEN, and A. C. RICHER (*Pennsylvania Sta. Bul.* 403 (1941), pp. [2]-62, figs. 13).—A comprehensive group of studies on buckwheat included a survey of varieties and production in the State and dealt with responses of four varieties to lime, manure, and fertilizers; influences of soil environment on growth, yield, maturity, and other agronomic characteristics of each of the Common, Silverhull, and Japanese [all *Fagopyrum esculentum*] and Tartary [*F. tataricum*] varieties; relative shattering tendencies; changes in seed characteristics due to cross pollination; yields in relation to seeding rates; and factors influencing lodging and susceptibility to drought. Cultural practices are suggested, with comments on the feeding value of the grain and straw, buckwheat flour, and importance of the crop as a green manure and soil renovator, weed destroyer, nurse or companion crop, and honey plant.

Buckwheat production in northeastern, central, and northwestern Pennsylvania has a definite place in the cropping system in relation to climate and soil conditions, being limited largely to the less productive soil areas of the Dekalb and Volusia series. Of the State buckwheat acreage, about 62 percent is on Dekalb soil. In the northern tier and bordering counties, including the glaciated soil area, many fields are too wet for early planting of corn, oats, and barley; wheat may suffer severely from winter killing; and the growing season is too short for full maturity of corn grain, except the earliest varieties. Buckwheat, under these conditions, becomes an important emergency crop. In Bradford County, an important buckwheat area, 38 percent of the total acreage normally seeded to grain is planted in buckwheat, an evidence of the value of its grain as a supplement feed for poultry and cattle.

A survey in 21 buckwheat-growing counties covering 40 farms showed that the crop always included a mixture of common varieties in the average proportions Common 23, Silverhull 39, and Japanese 38. Common or Common Gray is not considered a definite variety but includes characters of Silverhull and Japanese due to cross pollination. The borderline seeds differ in shape and size from their parents, and segregation occurs in successive generations. The four varieties reacted to differences in soil fertility with respect to height, proportion of leaves, roots, mature and immature seed, straw, blasted flowers, miscellaneous chaff and chemical composition, distribution of N in the plant, and tendency to lodge, but soil differences had little effect on relative growth rate and time of maturity. Common and Silverhull completed terminal growth in 8 weeks from planting, Japanese in from 6 to 7, and Tartary in 10 weeks. Japanese led Common and Silverhull in stalk diameter and strength, thickness of straw wall, distance between nodes, proportions of root to total weight of plant and of immature seed, weight and width or diameter of seed, equivalent bushels per acre, hull percentage, and growth rate, but not in plant height. Common and Silverhull showed no significant differences in the 23 physical measurements. Tartary led the other 3 varieties in proportions of immature to mature seed, of straw, and of leaves, plant height, thickness of stalk wall, stalk strength, number of mature and immature seed, hull percentage, and yield of mature grain. The grain at harvest averaged 16.8 percent water and the straw 80.4 percent. The weight per bushel of the grain, the average of 40 farm samples of mixed varieties, was 48.7 lb.

Since the root system in relation to the entire buckwheat plant, 2.89 percent, is considerably less than that of any other farm crop, continuous growth on the same land leads to depletion of organic matter and mineral nutrients. Only 5.4 percent of the total buckwheat plant is returned to the soil in roots and stubble, equivalent of only 3.1 percent of the N in the whole plant, and expressing the proportion of roots to the total plant of buckwheat as 100, the proportion for oats is 479, wheat 238, barley 298, and corn 188. The depressing effect of buckwheat on succeeding crops, as oats, on unfertilized land is attributed to its excessive removal of mineral plant food. On land supplied with P and K oats gave similar yields after corn and buckwheat. Based on the average yields of 13 buckwheat crops, superphosphate (P) showed a value of 100 compared to PK=104, PKN=97, and manure=76 for other fertility treatments.

Cultural recommendations for Volusia soil of the northern tier counties include the application of from 200 to 300 lb. of superphosphate per acre and sowing from 3 to 4 pk. of clean seed of mixed common varieties on land plowed at least 2 mo. before planting and harrowed to make a firm seedbed. For Dekalb soil, the advice is apply at least 200 lb. of superphosphate per acre

and 0.5 ton of limestone, or its equivalent in other forms of lime, every 3 yr. to improve yields by hastening the decomposition of humus as a N source. Rye or some other winter cover crops should be sown in the buckwheat stubble to increase the supply of available organic matter and to reduce soil erosion. Crop residues, i. e., green manures, appeared to be a better and safer source of N for buckwheat than commercial N or farm manure.

Tartary buckwheat—a "new" grain, A. W. CLARK (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, pp. 1, 5).—Tartary buckwheat (*Fagopyrum tataricum*) has yielded well but, as shown by tabulated analysis, has a slightly lower feeding value than the Japanese or Silverhull varieties. Tartary buckwheat is considered especially well adapted for use as an orchard cover crop, a soil renovator, and a weed destroyer because it is much hardier and less subject to frost and thrives much better on the poorest land than the ordinary varieties.

The effect of fertilizer and lime on the yield of corn, L. C. OLSON and R. P. BLEDSON (*Georgia Sta. Bul.* 214 (1941), pp. 19, fig. 1).—Fertilizer and liming tests with corn, 1939-40, on several soil types in seven counties, considered with results of other station experiments, indicated that with corn grown in a rotation with well-fertilized crops, fertilizer under the corn probably would not be profitable. A side dressing of from 125 to 200 lb. per acre of sodium nitrate about 6 weeks after planting or when plants are about 2 ft. high should be made unless corn follows a winter legume. On continuous corn or corn after a crop not heavily fertilized, from 100 to 150 lb. of superphosphate should be used under the corn and followed by a side dressing of sodium nitrate or other forms of inorganic N. A few soils may need some K. If the soil is medium to high in acidity, a broadcast application of 0.5 ton of dolomitic limestone every 3 to 5 yr. will probably be profitable, especially where the rotation includes a legume. Certain of the heavy clay soils of the Piedmont section may take 1 ton per acre of limestone, while on the lighter-textured soils of the Coastal Plain from 0.25 to 0.5 ton will be optimum. Limestone should be applied several months before planting, where possible.

Fertilizer experiments with Acala cotton on irrigated soils, D. A. HINKLE and G. STATEN (*New Mexico Sta. Bul.* 280 (1941), pp. 15, figs. 3).—Additional fertilizer tests (E. S. R., 77, p. 778) with Acala cotton grown continuously on an irrigated Gila clay adobe soil, 1929-40, are reported. Annual acre applications of 135 lb. of treble superphosphate or 150 lb. of ammonium sulfate did not materially affect yield, staple length, lint percentage, boll size, or maturity of cotton grown on this heavy soil. Their combination increased yields slightly but not profitably. Annual applications of manure resulted in an average increase of 143 lb. of lint cotton per acre over unfertilized plats, a significant and paying response. None of the fertilizer treatments used reduced the percentage of diseased (*verticillium* wilt) plants, which were most numerous on the lighter-textured soil areas of the field. Fertilizers used alone or in combination did not materially affect the total N, organic matter, or reaction of the surface or subsurface soil. Those containing P increased the available phosphate content. Use of manure increased total N, organic matter, and available P of the soil but did not affect the reaction.

In a second test on a lighter type of soil, 1937-40, a small response was obtained from either ammonium sulfate or superphosphate and a very good one from 16-20-0 Ammo-Phos. Annual applications of manure resulted in the greatest response even when manure supplied about the same amount of plant food as the commercial fertilizer, and also produced a much greater percentage increase in yield on poor light soil than on heavy soil.

Comparisons of different kinds of S on a very heavy plastic soil failed to show an increase in cotton yield compared with unsulfured plats.

Flax cropping, H. L. BOLLEY (*North Dakota Sta. Bmo. Bul.*, 3 (1941), No. 6, pp. 9-12).—The author's contributions to the flax industry in the Northwest are reviewed, with particular reference to varietal introduction and improvement for quality, seed yield, and freedom from flax diseases.

Miomark oats, S. P. SWENSON (*South Dakota Sta. Cir.* 32 (1941), pp. 4).—Miomark oats, developed from the backcross of a selection of the cross Iogold × Markton to Markton (made by M. Fowlds), is an early-maturing white variety highly resistant to local races of loose and covered smut and resistant to the most prevalent races of stem rust but susceptible to leaf (crown) rust. It is more vigorous and grows from 3 to 7 in. taller than Richland or Iogold. Heading out from 1 to 3 days after Richland, Miomark generally matures from 2 to 4 days later. For this reason it probably is better adapted to the eastern and northern sections than to central and western South Dakota. It appears to rank between Richland and Iogold in straw strength and will lodge on heavy rich soil with abundant moisture, although satisfactory in this respect under most conditions. Miomark has outyielded Richland consistently at Brookings and Eureka and equaled or slightly surpassed it in test weight. Miomark was about equal to Richland at Highmore, while in farm demonstration trials in 1940 it outyielded Richland by 9 percent for the State as a whole.

Peanut breeding, I-III, B. B. HIGGINS, K. T. HOLLEY, T. A. PICKETT, and C. D. WHEELER. (Partly coop. Ga. Coastal Plain Expt. Sta. and U. S. D. A.). (*Georgia Sta. Bul.* 213 (1941), pp. 18, figs. 4).—This bulletin consists of three parts and a bibliography (pp. 17, 18). For parts 2 and 3 see pp. 725 and 728.

Part 1, Peanut breeding and characteristics of some new strains (pp. 3-11).—This part deals with the breeding program begun in 1931, which resulted in about 1,350 strains worthy of further trial, including the general types (1) disease-resistant bunch with nonsprouting seed, (2) high-yielding strains similar to Spanish but not disease-resistant, (3) very tall, erect bunch types to be cut for hay, (4) very viny bunch types to be harvested for cattle feed, (5) high-yielding runner with low oil percentage in the seed for hogging-off, and (6) early-maturing runner for hogging-off. Some strains have consistently outyielded Spanish and North Carolina Runner and may replace them for certain purposes, but have not yet been grown in quantity enough for consumer acceptance tests. Comparative yields of peanuts and of air-dry cut hay and protein and crude fiber of hay from eight strains of hybrid peanuts are tabulated. Promising strains from the selected hybrid stocks were in the 1941 variety tests in 10 localities for determination of adaptations to soil types.

In a general survey of chemical composition covering about 600 strains, considerable variation was found in both N and oil content. Certain strains were high in oil and correspondingly low in N, some low in oil and high in N, and some unusually high in both. A more detailed study of composition was made on 24 hybrid strains showing wide variations in oil and N contents, selected for comparison with Spanish and North Carolina Runner. The tabulated results also include yields and some general characteristics of each strain. The values reported show no greater range for N and oil and for oil constants than previously reported. Practically all the P in peanuts was in the form of phytin, which, like the low Ca content, should be considered in feeding peanuts or peanut meal. The crop was observed to take up considerable Mg from the soil.

Potato yields and quality as affected by commercial fertilizers, F. M. HARRINGTON, V. E. IVERSON, and W. E. POLLINGER (*Montana Sta. Bul.* 392 (1941), pp. 20, fig. 1).—Effects of commercial fertilizers on the quality and yield of

Netted Gem and Bliss Triumph potatoes when grown under a wide range of conditions were studied, 1932-40, at the station and in cooperation with growers.

P used alone was almost universally beneficial and was always included in any good combination. Benefits attributable to P were earlier emergence and growth of plants, increase in set of tubers per hill and in yields, improvement in grade and in type, better netting on the Netted Gem potato, and better maturity and less skin slipping. N used alone seemed to have very little value on the crop, resulting in lower grades and poorer maturity and netting. When P is applied, N often has been a deficient element, and its use with P is essential for maximum improvements. K, as a rule, seemed to have very little place in a potato fertilizer program in the State. Maturity and netting were lowered very much by K, either alone or in combinations. B was found to be deficient in certain areas of western Montana, and results from B were obtained only when it was applied with either P or with N-P combination. The three fertilizer combinations which appeared to be beneficial were P as treble superphosphate or equivalent at the rate of 125 lb. per acre, ammoniated phosphate (6-30-0) from 125 to 150 lb. per acre, and boric acid 3 lb. in combination with 100 lb. of either treble superphosphate or ammoniated phosphate applied at rates indicated for the phosphates.

Fertilizer for rice in Texas, R. H. WYCHE (*Texas Sta. Bul. 602 (1941), pp. 18, figs. 4*).—Fertilizer experiments with rice (*E. S. R., 61, p. 729*), carried on from 1930-40, showed definitely that Lake Charles and Crowley clay soils respond more readily to N than to P. From 100 to 150 lb. per acre of ammonium sulfate has given more profitable results than lighter or heavier applications. Superphosphate alone did not result in appreciable yield increases, although its combination with ammonium sulfate produced larger yields than the latter alone during the later years of the test. In cooperative tests in the area, soils responded somewhat differently to the fertilizers. On Lake Charles clay in Liberty County and on the light-colored soils in Orange County, considered comparatively new land, superphosphate produced larger rice yields than did N. In tests in Jefferson County on Lake Charles and Crowley clay soils growing rice every second or third year for a long time, N gave the better results. In these cooperative tests, ammonium sulfate and superphosphate in combination produced larger rice yields than either alone. The results suggested that new lands first need P for rice, although under long cultivation N becomes depleted and the soil responds to N also.

Sodium nitrate, uramon, and ammonium sulfate produced about the same yields of rice, and the P carriers, bone meal, superphosphate, and granular superphosphate, also gave essentially the same results. The small increases in rice yield following K were too small to justify its general use for rice. Applications of Mn, Fe, Cu, Zn, and B did not increase yields. Rice receiving fertilizers in the drill with the seed at planting yielded about 12.5 percent more than with applications broadcast on top of the soil.

The application of a mixture of 100 lb. each of ammonium sulfate and of superphosphate per acre in the drill with the seed at planting, according to the results as a whole, appeared to be the most satisfactory fertilizer practice.

Sweet clover—its culture and uses, A. T. WIANOKO and R. R. MULVEY (*Indiana Sta. Cir. 261 (1940), pp. 14, figs. 7*).—Practical information on sweetclover, based extensively on the station's research, considers varieties; adaptation; uses for soil improvement, pasture and pasture renovation, and hay; cultural and management practices for different uses; and harvesting the seed.

Volunteer sweet clover, T. E. STOA (*North Dakota Sta. Bimo. Bul., 3 (1941), No. 6, pp. 3-6, figs. 4*).—Volunteer plants of sweetclover, sometimes numerous

enough to cause trouble in harvesting and threshing grain, have come from hard seed either failing to germinate when planted or from seed shattered when the sweetclover was allowed to ripen. Seeds were found to grow after remaining 23 yr. in the soil. To control volunteer sweetclover, operations preferably should be designed to destroy seedlings in spring, summer, or early fall, or, if this is impracticable, the task will be most easily accomplished by good plowing in the spring of the second year after growth has begun. This usually is too late for sowing early small grains, but often corn and other late-sown crops can be used. Plowing later as for summer fallow would likewise be effective.

Tobacco Substation at Windsor, report for 1940, P. J. ANDERSON, T. R. SWANBACK, and S. B. LeCOMPTE, JR. (Connecticut [New Haven] Sta. Bul. 444 (1941), pp. 223-286, figs. 7).—Research with cigar-leaf tobacco (El. S. R., 83, p. 485), including fertilizer, irrigation, plant bed, and black tobacco studies, is reported. Average analyses of materials which may be used in tobacco fertilization are appended. Accounts are also included on frost damage, the incidence of tobacco diseases, and insect investigations, noted on pages 729, 776, and 786 of this issue.

Influence of the nitrogenous fertilizer materials on the nitrogen content of the cured leaves (pp. 229-232).—Examination of tobacco from plats receiving 10 different N carriers in 1939 showed that leaf supplied with cottonseed meal had the lowest contents of total N, nitric N, and ammoniac N, while these N fractions were highest in tobacco receiving ammonium sulfate, sodium nitrate, and corn gluten meal, respectively. Ammonium sulfate also resulted in the highest percentage of nicotine and was followed by castor pomace and cottonseed meal. The upper leaves (darks) had higher percentages of total N, ammonia, and nicotine than the lower leaves (seconds), agreeing with previous analyses. The percentage of nitric N showed no relation to the position of leaves on the stalk.

Ammonification and nitrification of certain fertilizer materials, T. R. Swanback (pp. 232-244).—The course of ammonia production and nitrate formation from various N fertilizers under tobacco were studied during the summers of 1939 and 1940. The data indicated that a safe practice is to include several N sources in the formula to provide the most uniform ratio of nitrates to ammonia and to furnish adequate quantities of nitrates in the later growth period. According to tests on Pomeroy field, N derived from castor pomace is from 20 to 25 percent more efficient and from soybean oil meal from 14 to 15 percent more efficient than N in cottonseed meal. Cottonseed meal, however, appeared to be the least harmful material when used in excess or in a dry season. Another test in which soybean oil meal replaced cottonseed meal in tobacco fertilizer on a basis of about 20 percent greater efficiency gave further evidence that yields may be maintained and grading improved by using soybean oil meal on an efficiency basis.

Comparison of cottonseed meal with soybean oil meal (pp. 245-246).—In field tests, 1939-40, tobacco receiving soybean oil meal averaged 1,904 lb. per acre and cottonseed meal 1,780 lb., and the grade indexes were 0.349 and 0.372, respectively. The total crop index on soybean meal plats (yield \times grade index) was 14 percent better.

Residual effect of stable manure on yield and grading of Havana Seed tobacco (pp. 246-249).—Tobacco grown with uniform fertilization in 1940 on land that had been in experiments for 10 yr., part heavily manured and part receiving commercial fertilizer, yielded 1,935 and 1,548 lb. of leaf per acre, respectively, grading 0.454 and 0.341, and with respective crop indexes of 878 and 527. The better crop on the manured land was attributed to the higher levels of all the

main nutrient elements in the soil. The soil of the plot receiving 40 tons manure per acre annually had 81 percent more total N than that treated with 1,500 lb. of 6-6-8 fertilizers, available P 33, K 58, Ca 30, Mg 150, and organic matter 60 percent more.

Further experiments on the relation of calcium to the growth of tobacco, T. R. Swanback (pp. 249-260).—Experiments, 1936-39, dealt with the effect of Ca on growth, yield, and quality (grading, burn, and taste) of tobacco. Plots to which 0, 100, 300, and 600 lb. per acre of CaO were applied received scheduled applications of fertilizer. From 1,800 to 2,400 lb. CaO per acre, as supplied by the highest rate, added to the original very low content of Ca in the soil were needed for a proper balance between Ca, K, and Mg. These corresponded to a medium to medium-high reading, according to the station soil testing method (E. S. R., 77, p. 302). When a soil is low in Ca its entire needs should not be satisfied in one application, for minor elements may be tied up in the soil. The soil content of other bases, particularly K, should be satisfactory, since efforts to improve the Ca status in a soil low in K content leads to further impairment of the burn. Increase of Ca in the soil lowered somewhat the K in the leaves even under conditions of a relatively high K level in the soil. While improvement in grading and sometimes in yield was effected with Ca additions, the taste of tobacco was improved substantially only when the highest acre rate, 600 lb., had been used for several years.

Starter solutions (pp. 260-264).—The method of saving part of the fertilizer for a side dressing at time of second hoeing appeared to be safer than using starter solutions. Yield, grade index, and relative crop values declined in the order no solution and solutions containing N, NK, and NPK, respectively. Addition of a rather weak nutrient solution to water at planting appeared better than attempting to aid growth of young plants with vitamins and other substances claimed to promote growth.

Irrigation of Havana Seed tobacco in 1940 (pp. 264-265).—Results of irrigation tests, considered with earlier observations, indicated that yield and quality may be improved in a dry year by irrigation if nitrates are added during irrigation to replace leachings and to provide for further growth of leaves. Irrigation without nitrate may do more harm than good on a light, sandy field.

Lumarith, a substitute for glass in the seedbed sash (pp. 260-270).—Plants developed as well under lumarith, a very light, pliable, strong transparent plastic made from cellulose acetate, as under glass, and its substitution for glass gave no disadvantages and provided a tighter covering.

Studies on black tobacco, S. B. LeCompte, Jr. (pp. 270-278).—The term "black" tobacco is applied to a dull, matte-surfaced, low-quality leaf that cures very dark brown with a blue-gray or purple-gray hue. The ash is often muddy in color. Black leaves may occur in the curing of shade. Havana Seed, and Broadleaf tobacco, being seen oftenest in shade tobacco. Such tobacco should not be confused with the natural dark grades. Preliminary studies showed that the black shade tobacco tested generally had greater average contents of Mn and Fe than light shade leaf. This seemed due to deficient supply in the soil of Ca and/or active P, together with an unfavorably acid soil reaction. The relation indicated between such tobacco and soil acidity and Ca and P supply led to the suggestion that a soil producing black tobacco and found to be too acid or lacking in Ca or P should receive lime and some carrier of P.

Analysis of yield of hard red spring wheat grown from seed of different weights and origin, L. R. WALDRON. (N. Dak Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 8, pp. 445-460).—When two classes with kernels weighing 26.6 and 40 mg., separated from seed wheat from a presumably pure line,

were compared by using either the same weight of grain or the same number of kernels per unit area, the heavier kernels resulted in the larger yield, with small but highly significant average differences. Heavy-kerneled seed matured in the greenhouse gave yields averaging 2 bu. per acre above those from light-kerneled seed, matured out of doors, a significant difference. Very significant zero-order correlation was found between yield and heads per plant and yield and kernels per head. All partial correlations of the first and second order were highly significant when yield was the dependent variable. Partial regression coefficients were all highly significant. The regression of yield on heads per plant was nearly 7.4 bu. per acre for each unit change of head, 1.6 bu. for each unit change in kernels per head, and 12 bu. for each milligram change in kernel weight. Heavy-kerneled varieties showed higher yields.

Making the most of available seed stocks, M. T. MUNN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, p. 15, fig. 1).—Controls to insure trueness to type and variety, quality, and freedom from weed seeds are described for seed buyers.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (Partly coop. U. S. D. A.). (*Indiana Sta. Cir.* 259 (1940), pp. 125, fig. 1).—The germination, purity, and weed seed contents, and for legumes the hard seed contents are tabulated from tests of 1,351 of the 1,765 official samples of seed collected from vendors in Indiana during the year ended June 30, 1940.

Sodium chlorate treatment in late summer will control noxious weeds in small areas, B. J. THORNTON (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 3, pp. 6-8, fig. 1).—Tests involving the use of sodium chlorate, largely in relation to control of bindweed, suggested a 2-yr. control period, limiting chemical treatment to areas 0.25 acre or smaller; uniform distribution in dry form between July 1 and frost, preferably in August, September, or October; and a 3-lb. per square rod initial rate in the first season and following with the quantity required by the return growth in the second season.

HORTICULTURE

[**Horticultural studies by the Idaho Station.** (Partly coop. U. S. D. A.). (*Idaho Sta. Bul.* 239 (1941), pp. 33-34, 36-38, fig. 1).—Among studies, the progress of which is discussed, are the development of prune nectar, by L. Verner and C. F. Dietz; and the production of carrot seed, by G. W. Woodbury and Dietz.

[**Horticultural studies by the Kentucky Station**] (*Kentucky Sta. Rpt.* 1940, pt. 1, pp. 40-41, 42-46).—Information is presented on the progress of the following studies: The use of analyses of tomato plants as a guide to fertilization, absorption of N by tomato plants following side dressing with nitrate of soda, testing of tomato and cabbage varieties, effect of N and P on the yield of lima beans, use of sprays to prevent the premature dropping of apples, relation of mulching and fertilizing to winter injury of red raspberries, and testing of raspberry, dewberry, blackberry, and strawberry varieties.

[**Horticultural studies by the Fruit and Truck Station**] (*Louisiana Sta. Fruit and Truck Sta. Bien. Rpt.* 1939-40, pp. 3-17, 18-20, 21-23, 23-24, 30-31).—Among studies, the progress of which is reviewed, are the culture and fertilization of strawberries, breeding and variety tests of strawberries and control of red spider, fertilizers for and varieties of peppers, snap beans, and cucumbers, fertilizers for cabbage, culture of tung trees, fertilizers for the satsuma orange, okra breeding, and varieties of May haws, blackberries, dewberries, grapes, pecans, blueberries, eggplants, and tomatoes, all by W. F. Wilson, Jr.; and the protection of strawberry blooms from spring freezes by covering with paper, by A. G. Plakidas.

[Horticultural studies by the North Louisiana Substation], P. L. HAWTHORNE (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1939-40, pp. 21-24, 26-27, 28-30*).—Among investigations discussed are variety and fertilizer trials with tomatoes and watermelons and variety tests of peaches, apples, and pecans.

[Horticultural studies by the Massachusetts Station]. (Partly coop. U. S. D. A. et al.). (*Massachusetts Sta. Bul. 378 (1941), pp. 48-49, 72-75, 82-84, 84-99*).—Included are reports on the following studies: Oxygen content of winter flooding water in relation to injury to cranberry vines, by H. F. Bergman; the breeding of snapdragons, nutrition of the gardenia, culture of freezias, soilless culture of flowering plants, value of banana stalk fiber as organic matter for soil improvement, and liming of carnation soils, all by H. E. White; testing of packaged flower seeds, by C. L. Thayer; propagation of the hemlock and lilac, and factors influencing the hardiness of evergreens, all by H. S. Tiffany; variety tests of vegetables, tomato breeding, organic matter for greenhouse tomatoes, and effects of mulching tomatoes and peppers, all by W. H. Lachman and G. B. Snyder; sweet corn breeding, testing of hybrid sweet corn, and cultural requirements of the pepper, all by Lachman; varietal improvement and culture of asparagus, and improvement of vegetables by breeding and selection, both by R. E. Young; influence of clonal rootstocks on apple varieties, by J. K. Shaw and L. Southwick; tree characters of fruit varieties, by Shaw, A. P. French, O. C. Roberts, and Southwick; genetic composition of the peach, by J. S. Bailey and French; cultural and fertilizer requirements of fruit trees, by Shaw; varieties of fruits, by Shaw et al.; bud mutations in the apple, by Shaw, W. H. Thies, and Southwick; storage of apples in modified atmospheres, by Roberts and Southwick; nutrition and culture of the highbush blueberry, by Bailey; control of premature dropping of the McIntosh apple, by Southwick; and the use of peat in planting apple trees, and the relation of spray materials to soil acidity in orchards.

[Horticultural studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1940]. pp. 2, 20-25, 42-43, 47-48, 49-52*).—Included are reports on the following investigations: Inheritance in blackberries, fertilizer and organic matter requirements of garden crops, variety and strain tests with vegetables, the breeding of eggplants, fumigation of vegetable soils, nutrient solutions for starting tomato plants, factors determining mild flavor in onions and quality in celery, use of plant growth substances to control preharvest dropping of apples, propagation of hardwood blueberry cuttings, effect of sprays on the growth of apple trees, cultural practices for young apple trees, and factors involved in the development of scald on stored apples.

Sprays—their preparation and use, R. H. ROBINSON (*Oregon Sta. Bul. 393 (1941), pp. 34*).—Information is presented regarding spraying and dusting materials, with reference to their chemical composition, compatibility with other substances, preparation, and effective application.

The home vegetable garden, H. L. COCHRAN (*Georgia Sta. Bul. 215 (1941), pp. 40, figs. 7*).—Information of a general nature is presented on the planning, preparation, planting, and cultural care of the home garden, with comments on the protection of plants from pests and on the harvesting and handling of the vegetables.

Drought tolerance in snap beans, M. F. BABB, J. E. KRAUS, B. L. WADE, and W. J. ZAUMEYER. (U. S. D. A.) (*Jour. Agr. Res. [U. S.], 62 (1941), No. 9, pp. 543-553, figs. 5*).—Over a 4-yr. period certain commercial varieties of snap beans were compared at the U. S. Horticultural Field Station, Cheyenne, Wyo., with U. S. No. 1 Refugee and U. S. No. 5 Refugee and related strains as to relative drought tolerance. The two numbered Refugee varieties and certain of the

hybrid strains possessed the ability to yield better under drought or semi-drought conditions than did the commercial varieties. A majority of the varieties and strains showed a significant decrease in pod size whenever available soil moisture became limiting, but a few showed an actual increase in pod size. In general, the commercial varieties were more stable with respect to pod size than were the hybrid strains. Of various climatic factors, rainfall was the most determining factor on pod size. The occurrence of bacterial blight in 1938 afforded an opportunity to compare the various beans with respect to their relative resistance. Under dry-land conditions U. S. No. 5 Refugee and Full Measure were least injured, and under irrigation U. S. No. 5 Refugee ranked first in resistance.

Hop growing shows marked trend upward in this State (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, pp. 12, 14).—This brief article points out the rapid increase in acreage and production of hops and discusses dusting and spraying operations for the control of diseases.

Effect of irrigation practices on the growth and yield of White Grano onions, A. S. CURRY (*New Mexico Sta. Bul.* 281 (1941), pp. 34, figs. 12).—In presenting the results of 3 years' work on the effect of irrigation, the author points out that adequate moisture is essential to the production of satisfactory yields and good-quality onions. Within practical limits, irrigation treatments had no significant effect on the development or formation of seedstalks, nor was the percentage of moisture in the bulbs or the ratio of tops : bulbs affected materially by irrigation. There was some evidence that fewer than the customary number of irrigations in the early season might be feasible as a means of saving water. Growth rate was not found a satisfactory means of determining the need for water as apparently the onion may suffer injury from insufficient water prior to an actual decrease in growth rate. Diameter measurements were effective in determining the time of maturity of the bulbs.

The effect of climate in British Columbia on the chemical composition of tomatoes, G. H. HARRIS (*Sci. Agr.*, 21 (1941), No. 11, pp. 679-683).—A total of 10 varieties, grown at Vancouver, B. C., was examined with respect to fruit characteristics and composition. Notable differences were observed among varieties in their morphological and chemical characteristics. Valliant, for example, was high in vitamin C and low in ash, but Earliana was relatively low in vitamin C and high in ash. The pH content was found rather uniform, except for one variety. When the canned fruits of Earliana, obtained from six locations in British Columbia and one in Ontario, were examined, it was found that the drier areas with the higher temperatures and greater hours of sunshine produced tomatoes of a higher sugar and vitamin C content. Potash was also higher in the fruit from warmer areas, with some indication of a slight correlation between high potash, high sugar, and high vitamin C. The pH, dry weight, total ash, and N and P contents were apparently not correlated with climatic variations.

The answer to your tomato problem, L. G. SCHERMERHORN ET AL. (*New Jersey Stat. Civ.* 414 (1941), pp. 20).—In the form of questions and answers, information is presented as to varieties, methods of growing plants, cultural practices, fertilization, control of insect and disease pests, the handling of the crop, etc.

Compatibility of Bechtel's crab on some Malling rootstocks, W. H. UPSHALL (*Sci. Agr.*, 21 (1941), No. 11, pp. 687-688).—Malling rootstocks showed varying degrees of incompatibility with Bechtel flowering crab, varying from complete failure with Malling IX to fair compatibility with Malling I. At the

same time certain other crab apples developed favorably on the Malling rootstocks.

Fruit characteristics of red strains of apples, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul. 210* (1941), pp. 120-127).—Observations on the fruits of standard and red strains of Delicious, Rome Beauty, Jonathan, Stayman Winesap, and Northern Spy, harvested on the same dates and stored under identical conditions, showed certain differences between the red strains and their parents. However, these differences were not always consistent or conclusive, leading to the comment that from the standpoint of the commercial grower there was no evidence to warrant picking red strains before the standard.

Factors affecting size and color of fruit (with reference to apples and peaches), A. E. MURNEEK (*Missouri Sta. Bul. 428* (1941), pp. 19, figs. 9).—This paper discusses various factors such as climate, variety, vigor of tree, available leaf area per fruit, pruning operations, fruit thinning, etc., that influence the development and coloring of the fruits. Some information is given on the use of preharvest sprays, sun-coloring following picking, and the effects of branch ringing.

Studies in maturity and cold storage of peaches, R. S. WILLISON (*Sci. Agr., 21* (1941), No. 10, pp. 624-645, figs. 5).—Of various criteria of picking maturity in peaches, the pressure test appeared most reliable. Fruit harvested when pressure readings on the unpeeled cheek averaged 19-20 lb. and measured with a penetrometer having a plunger $\frac{5}{16}$ -in. in diameter ripened more or less satisfactorily at room temperature. Color was not reliable, but was helpful in grading the fruit of a single harvest into lots of different maturities. Soluble solids concentration in the juice increased with maturity, but the changes were too slight and the trends too inconsistent to serve as a reliable index. Rochester, Vallant, and Vedette peaches kept for 10-14 days at 45° F. and for 3 weeks or more at 33° without serious loss of quality. Elberta peaches developed bitter and astringent flavors after about 10 days at either temperature. Break-down was in the form of mealiness, aeration of the flesh, and internal browning. Of the four varieties, Rochester was most and Elberta least resistant to break-down.

Blossom position in pear clusters and set of fruit, E. W. JENKINS (*Vermont Sta. Bul. 471* (1941), pp. 24, figs. 20).—Using the technic of hand-pollination and working with such varietal combinations as Dempsey × Tyson and Pulteney × Ford, the author found that pear blossoms situated on the lower part of the cluster base set many more fruit than did those located on the upper part, provided all were pollinated. The blossom located just below the terminal was usually the weakest in the cluster. Removal of the blossoms from the upper half of the cluster brought about a nearly uniform set of all those remaining except the lowest one. The high percentage of fruit set occurring in each position when only one flower was left on a cluster indicated that all the various blossoms were potentially capable of developing fruit.

Cherry fruit passes thru three distinct growth stages, H. B. TUKEY (*Farm Res. [New York State Sta.], 7* (1941), No. 3, pp. 2, 3, 16, figs. 6).—This material, now presented in a more popular form, was noted previously (*E. S. R.*, 82, p. 51).

Plum variety trials at the Purdue farm, Bedford, Indiana, C. L. BURKHOLDER (*Indiana Sta. Bul. 458* (1941), pp. 20, figs. 5).—Accompanied by information relative to botanical relationships, pollination, pruning, spraying, harvesting, etc., data are presented on the yield, selling price, time of blooming and ripening, character of the fruit, and general performance of a considerable number of plums tested over a period of years. Among the most productive varieties were Pacific, Stanley, Diamond, and French Damson. The Diamond is

not, however, recommended because of its low-quality fruits. Practically all of the desirable varieties belonged to the European or domestica group.

Recent progress in strawberry breeding, A. N. WILCOX. (Minn. Expt. Sta.). (*Minn. Hort.*, 69 (1941), No. 5, p. 83).—A description is given of a new, promising, spring-fruited strawberry, Minnesota No. 1192, and of the methods employed in the development of new varieties by the process of inbreeding and recombination.

What new grape varieties are doing: A survey of growers, R. WELLINGTON and H. O. BENNETT (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, p. 10).—The fourth in a series of articles (E. S. R., 85, p. 196), summarizing reports received from fruit growers on varieties introduced by the station, discusses the Urbana, Seneca, Dunkirk, Brocton, Hanover, Watkins, Wayne, Erie, and Concord Seedless grapes.

Further studies with the muscadine grape, E. F. SAVAGE, L. ASCHAM, T. L. BISSELL, W. L. BROWN, T. A. PICKETT, W. A. JENKINS, M. M. MURPHY, JR., and J. G. WOODROOF (*Georgia Sta. Bul.* 217 (1941), pp. 36, figs. 20).—In this general discussion of the muscadine grape information is presented on varieties, planting, culture, propagation, pollination requirements, control of insect and fungus pests, harvesting, utilization, etc. The differences between the muscadine grapes and the so-called northern grapes, such as Concord, are pointed out, with special reference to botanical distinctions and differences in the composition of the juice. During the last 25 yr. the station has developed and introduced 13 varieties of muscadine grapes possessing, in one or more respects, qualities superior to those of commercial varieties.

Fig characteristics useful in the identification of varieties, I. J. CONDIT. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.]*, 14 (1941), No. 1, pp. 1-68, pl. 1, figs. 25).—Presenting brief historical, botanical, and other information on the cultivated fig, the author discusses technically various characters of the fruit, leaves, tree, woody tissues, bark, terminal growth, buds, etc., that might be used in the classification of varieties and types.

Pollination of Theobroma cacao L. in Trinidad, B. W. I., D. J. BILLES (*Trop. Agr. [Trinidad]*, 18 (1941), No. 8, pp. 151-156, figs. 3).—Discussing various possible agencies in pollination, such as water, wind, and insects, the author reports on the basis of experiments that pollination occurs only by insect visitation. The only species that are either sufficiently numerous or efficient are the pollination midge, the cacao flower thrips, and aphids. The effect of pollination on the yield of self-compatible and self-incompatible cacao trees is discussed.

Fertilization of ornamental trees, shrubs, and evergreens, L. C. CHADWICK (*Ohio Sta. Bul.* 620 (1941), pp. [1]+29, figs. 6).—Various methods of fertilizing woody ornamentals by surface applications, trenching and placement in holes, and direct tree application by spraying and injection are discussed. Studies made during 1937-38 on the distribution of Moline elm roots in relation to methods of application showed the unfertilized controls to have the lowest average number of roots and, in most cases, the least number of roots with fibrous rootlets. There was evidence of toxicity from the use of ammonium sulfate, especially to the roots near the surface. From 96 to 100 percent of the roots were in the upper 24 in. of soil. The highest percentages of roots in the upper 6 in. were recorded in trees fertilized with 6-6-4 and 8-5-3 materials, and the lowest percentages in trees in the 12-6-4 and 11-48-0 plats. Apparently, P promoted a deeper penetration of roots, as well as a more fibrous root system. The 8-5-3 and the 12-6-4 materials tended toward a more spreading root system. As a result of the studies it is suggested that fertilizers be placed in an

area starting within a short distance of the trunk and extending well beyond the spread of the branches. There should be from 15 to 25 holes made for each inch of trunk diameter. Since from 84 to 95 percent of the fibrous roots occur in the first 18 in. of soil, a depth of from 15 to 18 in. should be ample for the holes. With regard to time of application, fall treatments made after rains had moistened the soil gave good results in most years. Complete fertilizers or those containing N and P gave the better results. Rates of application, most suitable materials, etc., are presented for different types of woody plants.

FORESTRY

Seasonal course of height growth in some hardwoods in Connecticut. R. KIENHOLZ (*Ecology*, 22 (1941), No. 3, pp. 249-258, figs. 4).—Growth measurements taken over a period of 4 yr. in northwestern Connecticut at an elevation of about 1,200 ft. showed that most species start their height development in late April or early May. The curve of growth of any single species was uniform from year to year, especially the time of reaching the peak of most rapid development. With white ash, red oak, beech, and sugar maple, the peak was reached in late May, and growth ceased in late June. In gray and white birch the peak was not reached until mid-June, and growth continued until mid-August. Red maple had a course of growth intermediate between the above groups. Red pine behaved similarly to red maple, while European larch resembled gray birch. First-year stump sprouts started later, reached their peak later, and ceased growth much later than did young trees of the same species. Summer droughts slowed down growth in first-year sprouts, and rains, unless coming late in the season, caused a resumption of growth.

The effect of potash salts upon the hardening of coniferous seedlings. J. C. KOPTKE. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 6, pp. 555-558, fig. 1).—White spruce and white and red pine seedlings, growing in quartz sand in the greenhouse and in soil in outdoor nursery beds and supplied with varying amounts of K, were analyzed for various chemical and physical characters that might indicate comparative hardness. Applications of K promoted the accumulation of simple and invert sugars in the tissues, increased the content of total solids, and lowered the freezing point of the sap, hence the correction of K deficiency is recommended as necessary in the production of frost-resistant nursery stock. Applications of K above 300 lb. of K_2O per acre were harmful.

Five seasons' growth of conifers. D. B. COOK (*Ecology*, 22 (1941), No. 3, pp. 285-296, figs. 5).—At Stephentown, N. Y., it was found that the commencement of growth in a group of conifers varied from May 4 for red pine to June 3 for red spruce. The growing period was 50-60 days for pine and spruce, 85 for hemlock, and almost 100 days for larch. Red pine completed its growth before July 1, while the larches continued into September. The pattern of the growth curves for the various species was rather constant from year to year. Only exceptional deficiencies in rainfall or unseasonably low temperatures appeared to modify growth once it had started.

Competition influence on the root systems of jack and Norway pines. W. R. ADAMS and G. L. CHAPMAN (*Vermont Sta. Bul.* 472 (1941), pp. 32, figs. 14).—Studies made in a 28-year-old plantation the trees of which were spaced 2 by 2, 4 by 4, 6 by 6, and 8 by 8 ft. showed the horizontal roots to be concentrated mainly in the A₁ horizon regardless of the degree of competition due to the density of spacing. Ninety percent or more of the horizontal roots were located above the lower limits of the B horizon and were for the most part less

than 0.05 in. in diameter. Both pines developed strong vertical roots, those of the Norway pine being larger in diameter and penetrating more deeply than those of the jack pine. Lateral roots grew downward when competition in the upper horizons became acute, the downward penetration starting midway between adjacent trees. The jack pine formed no taproots. The seasonal mean available soil moisture percentages at a 4-in. depth were usually slightly higher with each increase in spacing. At 12 in. the seasonal mean was slightly higher for each increase in spacing for jack pine but slightly lower for Norway pine. In the denser stands, moisture percentages were frequently below the wilting coefficient in those soil layers containing most of the horizontal roots. The deeply penetrating roots undoubtedly supplied essential moisture to the trees during periods when the surface layers lacked available moisture.

Growth of Douglas fir in eastern Idaho, C. MILES. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 8, pp. 689-692).—A study of records taken in a stand of Douglas fir, last cut-over in 1879, showed that there is a certain reserve volume per acre which yields the maximum net increment. This optimum reserve volume varies with the quality of the site, the better the quality the greater the volume. In trees on sites 4, 5, and 6, net annual increment reaches a maximum during the fifth, sixth, and seventh decades after initial cutting. Poles and reproduction contribute almost one-fourth the total volume attained at the end of the sixth decade.

Some aspects of flower and cone production in ponderosa pine, J. ROESER, JR. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 6, pp. 534-536, fig. 1).—Beginning in 1926 and continuing for nine seasons, phenological records were taken on trees in central Colorado. The normal blossoming period of ponderosa pine was found to occur in mid-June after danger of freezing. Staminate flowers may open shortly before the last freezing weather, but the pistillate flowers appeared rarely until after freezing ceased. The production of staminate and pistillate flowers was closely correlated. Large flower crops were the rule, and the size of the cone crop could not be predicted except in the case of very small flower crops. Cones made about one-third their growth the first season, and the balance the second. The average green weight of cones and the weight of seeds decreased as the number of cones per cluster increased.

The durability of untreated oak posts in the Southwest, W. H. LONG (*Jour. Forestry*, 39 (1941), No. 8, pp. 701-704).—Observations in Arizona and New Mexico at elevations of 4,500-9,000 ft. and on fences ranging in age from 5-60 yr. showed that the main factors governing deterioration of fences are age, species of oak used, and the condition of the posts when set. It was evident that sound, untreated "Gambel" oak posts, set green and unpeeled, can endure for 30-40 yr. In descending order of durability were the Gambel, Arizona, and Emory oaks. Seasoning and peeling shortened the life of the posts, and defects such as knotholes and heart rots contributed to their destruction.

The Eucalyptus in Brazil, E. NAVARRO DE ANDRADE (*Jour. Hered.*, 32 (1941), No. 7, pp. 215-220, 240, fig. 1).—Describing the present status of eucalyptus production in Brazil, with its relatively enormous plantations for fuel, paper pulp, railroad ties, etc., the author discusses the painstaking work in assembling and testing species and hybridization and in learning how to use the wood effectively.

Ohio Forest News, [July 1941] (Ohio Forest News [Ohio Sta.], No. 38 (1941), pp. 8, figs. 3).—In the usual manner (E. S. R., 82, p. 196) there is presented general information regarding State forests, forestry activities, forest land utilization, wood utilization, etc.

DISEASES OF PLANTS

Report of the 1941 annual meeting of the southern division of The American Phytopathological Society (*Phytopathology*, 31 (1941), No. 8, pp. 767-772).—Abstracts begun on the pages indicated are included: Page 767, Correlation of Spore Load With Incidence of Infection in Red Rot [*Colletotrichum falcatum*] of Sugar Cane, by I. L. Forbes; Snap Bean Tissues Affected With Black Root, and Some Leaf Spots and Berry Rots of Muscadine Grapes in Georgia, both by W. A. Jenkins. Page 768, Control of Nursery Blight [*Elstnoe randii*] of Pecan Seedlings by Spraying With Low-Lime Bordeaux Mixture, by J. R. Large and J. R. Cole; Mode of Action of Certain Cotton-Seed Treatment Materials, by S. G. Lehman; Downy Mildew [*Sclerospora macrospora*] on Oats in Mississippi, and Effect of Storage of Treated Cotton Seed in Closely Woven Cotton Bags, both by L. E. Miles. Page 769, Fungi Associated With Diseased Cotton Seedlings and Bolls in 1938, 1939, and 1940, by P. R. Miller and R. Weindling; Cotton-Seed Treatment Tests in Louisiana in 1940, and 1940 Regional Cotton-Wilt Studies—Phosphate-Variety Tests in Louisiana, both by D. C. Neal; The Effect of Various Fungicidal Dusts Upon Cantaloupes in Seasons Characterized by a Low Incidence of Downy Mildew, by C. J. Nusbaum. Page 770, The Role of Hot Water Seed Treatment in the Control of *Cercospora* [*sesami*] Blight of Benne, by C. J. Nusbaum; Copper-Sulphur Dusts and Copper Sprays Give Good Control of Peanut Leaf-Spot Diseases, by L. Shaw and T. T. Hebert; Pathogenicity Tests of Different Isolates of *Fusarium vasinfectum* in 1940, and Regional Studies of *Fusarium* Wilt of Cotton in Tennessee, in 1940 (coop. U. S. D. A.), both by C. D. Sherbakoff. Page 771, Regional Cotton-Variety-*Fusarium*-Wilt-Phosphorus Study, by A. L. Smith; Nematode Distribution in the 1940 Regional Cotton-Wilt Plots, by A. L. Smith and A. L. Taylor; Mineral-Deficiency Symptoms in Cotton in the Greenhouse, by W. H. Tharp and C. H. Wadleigh; A New Leaf Spot [*Cephalosporium acremonium*?] of Fig, by E. C. Tims; and *Fusarium* [*Martiiella* Group] Hypocotyl Rot of Lupines, by J. I. Weimer (U. S. D. A. and Ga. Expt. Sta.).

The Plant Disease Reporter, [July 1 and 15, 1941] (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 12, pp. 321-338; 13, pp. 339-363, fig. 1).—In addition to the host-parasite check-list revision, by F. Weiss (No. 12, *Lavatera* to *Lonicera*, and No. 13, *Lucuma* to *Magnolia*), the following items are noted:

No. 12.—Diseases of fruits and vegetables on the New York market during the months of October, November, and December, 1940, by J. S. Wiant and C. O. Bratley; flag smut (*Urocystis tritici*) of wheat in Washington State, by C. S. Holton; sclerotial seedling blight (*Sclerotium rolfsii*) of black walnut, by W. N. Ezekiel and C. Nelson, Jr.; and brief notes on a possible virus disease of black locust in Kentucky, crown gall on *Euonymus radicans* and *Cornus* sp., wheat bunt in Oregon and Washington, and first recorded incidence of *Puccinia glumarum* in the United States east of the 103d meridian.

No. 13.—Noteworthy diseases of economic crops and native plants in lower Rio Grande Valley in the spring of 1941, by G. H. Godfrey; losses from potato diseases in the Hastings section, Florida, in 1941, by A. H. Eddins; potato late blight in New York and Wisconsin; peach leaf curl in Illinois in 1941, by G. H. Boewe; reports on cereal diseases, including *Leptosphaeria* on maize in Costa Rica, stem rust in Texas, condition of small grains in Kansas, and a correction—diseases of small grains in South Carolina; and brief notes on a new host (*Prunus besseyi*) for the X-disease virus with *P. hortulana* immune or a symptomless carrier, and survival of the onion bulb nematode (*Ditylenchus dipsaci*) in New York.

Crop losses from plant diseases in the United States in 1939, H. A. Edson and J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1940, Sup. 127, pp. 177-209*).—Tabulated data are included as to estimated reduction in yields due to diseases for apple, barley, dry and green beans, cherry, field and sweet corn, cotton, grape, oats, peach, pear, peas for manufacture and for market, potato, rye, strawberry, sugar beet, sweetpotato, tobacco, tomatoes for manufacture and for market, and wheat.

[Plant disease work by the Idaho Station] (*Idaho Sta. Bul. 239 (1941), pp. 55-59, 64-65, 75-76, fig. 1*).—Progress reports, by J. M. Raeder, E. M. Graves, J. L. Toevs, D. M. Murphy, W. J. Virgin, J. C. Walker, E. C. Blodgett, and R. E. Knight, are given on potato ring rot, including transmission, seed certification, and tests of toxic materials for prevention of spread; seed treatments for potato scab; breeding potatoes and beans (coop. U. S. D. A. et al.) for virus disease resistance; testing pea selections for near-wilt resistance and studies of poor germination (coop. Univ. Wis.); resistance of *Lycopersicon chilense* to curly top virus; fungus storage rots of carrots; and a canker and dieback of youngberry, boysenberry, and blackberry associated with *Septoria* sp. and *Glomerella cingulata*.

[Plant disease studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 34-37, 42, 44*).—Reports of progress are given on studies of tobacco diseases, including mosaic-resistant Burley and dark tobaccos, mosaic control, tobacco streak on tomato and potato and tobacco infection from sweetclover, ring spot and so-called acquired immunity, angular leaf spot and wildfire outbreaks, *Cercospora nicotianae* leaf spot, black rot incidence and severity, and potash deficiency and other soil conditions in relation to tobacco diseases; yellow copper oxide v. bordeaux as a fungicide for tomato; and absence of phony disease of peach in the State (coop. U. S. D. A.).

Plant pathology, A. G. PLAKIDAS (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1939-40, pp. 25-30, 31-37*).—Brief reports are given on strawberry leaf disease spray tests (chiefly for control of *Mycosphaerella fragariae*), purple leaf spot due to *M. louisianae*, *Cercospora* leaf spot, and nature of resistance to *M. fragariae*; crown and root rot of pear and tung trees due to *Clitocybe tabescens*, and association of *Dothiorella* sp. with the trouble; overwintering of *Entomosporium maculatum* in dead leaves of Chinese sand pear; control of cucumber downy mildew; and *Cercospora capsici* leaf spot of peppers.

[Plant disease studies by the Massachusetts Station]. (Partly coop. U. S. D. A. et al.). (*Massachusetts Sta. Bul. 378 (1941), pp. 19-20, 25-34, 49-50, 84*).—Reports of progress, by C. V. Kightlinger, A. V. Osmun, M. A. McKenzie, W. L. Doran, E. F. Guba, C. J. Gilgut, W. G. Colby, L. H. Jones, H. F. Bergman, and H. S. Tiffany, are given regarding tobacco investigations, including black root rot, soil treatments for seedbeds, and overwintering of common tobacco mosaic virus in soil under natural conditions; tree diseases in Massachusetts, including the Dutch elm disease problem, elm wilt due to *Verticillium* sp., a *Ceratostomella* disease of sycamore, *Phytophthora cactorum* bleeding canker of maples, and various other fungus diseases of trees; damping-off and growth of seedlings and cuttings of woody plants as affected by soil treatments and environmental modifications; diseases of ornamental herbaceous plants due to soil-infesting organisms, with particular attention to control measures; chemical soil surface treatments in hotbeds for controlling damping-off of early forcing vegetables; *Alternaria dianthi* blight of carnations; resistance of Bay State tomato to tomato leaf mold; diseases and other factors affecting onion yields and their shrinkage in storage; apple scab control; copper dusts for cucumbers and cantaloups; dormancy and disease in gardenia plants and

injury due to *Phomopsis gardeniae*; spraying experiments for controlling cranberry rosebloom and fruit rot; *Phomopsis*-associated defoliation and dieback in blueberries; and powdery mildew (*Erysiphe cichoracearum*) on garden phlox.

[Phytopathological studies by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 28-29, 35-37, 43-47, 48-49).—Brief reports are included on the incidence and control of diseases of bentgrass species; the effect of boron in overcoming blackheart in greenhouse celery; notes on an epidemic of *Puccinia peridermiospora* leaf rust of ash and the first confirmed case of bacterial ring rot of potato in the State; vegetable seed treatment tests; bleeding canker of hardwood trees (coop. Univ. Calif.); eggplant varietal reactions to *Phomopsis vexans* and *Verticillium* wilt; chloropicrin lethal diffusion patterns in soil and plant organs; *Phoma* dieback of *Daphne cneorum*; sweet pea root rot control in the greenhouse; *Fusarium* wilt of carnations; control of tomato field diseases; and spray programs for control of apple diseases.

Plant diseases pose numerous perplexing problems (*Farm Res.* [New York State Sta.], 7 (1941), No. 3, pp. 4-5, figs. 2).—This is a general discussion of disease control problems, with examples from the station work. Complicated by many factors, including weather, environment, and cost, successful attack involves not only the development of increasingly efficient and safe sprays and dusts but the selection and breeding of resistant varieties as well.

What station visitors can see in plant disease studies, O. A. REINKING (*Farm Res.* [New York State Sta.], 7 (1941), No. 3, pp. 11, 13, figs. 2).

Chemical inactivation and the reactivation of a plant virus, J. JOHNSON. (Wis. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 31 (1941), No. 8, pp. 679-701, fig. 1).—The effects of various chemicals on the infectivity of ordinary tobacco mosaic virus was studied by an agar-disc method permitting diffusion of the agents into virus contained in the agar and subsequent complete or partial extraction of the chemical by distilled water. In this way 41 chemicals harmful to infectivity were tested, and of these, 28 permitted reactivation of the virus. Reactivation was possible after inactivation by many common salts and acids at the proper concentrations, but was not secured after treatment with certain oxidizing agents, with bases above pH 11.0, or at concentrations and exposures much above the minimum required for inactivation. A number of common organic substances including milk, blood serum, citrus fruit extracts, and growth products of certain micro-organisms (chiefly *Aerobacter aerogenes* and *Aspergillus niger*) proved to be powerful immediate inactivators. All appeared to belong in essentially the same category with respect to the nature of the inactivating power, as does trypsin, aphid extract, *Phytolacca* extract, and possibly charcoal. No evidence was secured that trypsin or other substances tested modify the host. The results as a whole indicate that the trypsin and other chemicals inactivate the virus through formation of a relatively loose specific molecular union (chemical adsorption or physical absorption), which usually may be broken up by removal of the inactivator with water, provided the nature or concentration of the chemical, or the time of exposure to it, is not such as to cause destruction of the virus.

Classification of Hawaiian commelina-mosaic virus, W. C. PRICE (*Phytopathology*, 31 (1941), No. 8, pp. 756-758, fig. 1).—Two strains of this virus were transmitted by rubbing to *Nicotiana tabacum*, *Cucumis sativus*, and other dicotyledons. Both protected *Zinnia elegans* against the indicator strain of cucumber mosaic virus (*Marmor cucumeris judicis*), thus demonstrating them to be members of the cucumber mosaic group.

Sporulation injury associated with downy-mildew infections, C. E. YARWOOD. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 8, pp. 741-748).—Onions, spinach, and hops infected, respectively, with *Peronospora destructor*, *P. effusa*, and *Pseudoperonospora humuli* were divided into paired groups, one member of each being incubated overnight in a moist chamber to induce sporulation and the other maintained in a dry environment to prevent it. Sporulating plants 2-18 days later yielded 10-75 percent less green weight than nonsporulating infected plants. Transpiration or respiration was apparently not responsible for this sporulation injury. In the sporulation process about 5 percent of the dry weight of an onion leaf was transformed into sporangio-phores and sporangia in a single night, and it is suggested that this exhausting process may be responsible for the injury observed.

Variations in *Phytomonas vesicatoria*, W. H. BURKHOLDER and C. C. LI. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 8, pp. 753-755).—Certain strains of *P. vesicatoria* isolated from and pathogenic for pepper failed to infect tomatoes, but other pepper strains and all tomato strains tested infected both hosts. The isolates from tomatoes hydrolyzed starch, whereas those from pepper did not.

Studies on *Sclerotinia* and *Botrytis*, I. P. H. GREGORY (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 1, pp. 26-40, pls. 3, fig. 1).—Taxonomic pathological studies are presented on *S. polyblastis* and *S. narcissicola* n. sp. on narcissus and *S. sphaerosperma* n. sp. on *Allium* spp.

Tests with new copper fungicides with special reference to injury, tenacity to foliage, and dwarfing effect, H. T. HARTMANN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 148-152).—Bordeaux mixture was found undesirable for sour cherries due to the dwarfing effect on fruit and foliage and for apples early in the season due to burning of the foliage and russetting of the fruit. Several of the proprietary Cu sprays also caused rather severe injury under the conditions of use. In tests for control of the fungus leaf spot of cherries, bordeaux, Cupro K, Yellow Cuprocide, and Spray Cop proved adequate. Bordeaux and copper phosphate had both the largest initial Cu deposit on the leaves and the best adhesive qualities. Two materials combining control of the fungus with freedom from injury were Cupro K and Spray Cop and, according to this study, may offer promise as bordeaux substitutes.

Evidence of resistance in alfalfa, red clover, and sweetclover to certain fungus parasites, F. R. JONES, J. L. ALLISON, and W. K. SMITH. (U. S. D. A. and Wis. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 8, pp. 765-766).—Evidence of resistance was found in alfalfa to *Pseudopeziza medicaginis*, *Peronospora trifoliorum*, *Stagonospora melloti*, and *Stemphylium botryosum*; in red clover to *S. sarcinaeforme*, *Uromyces trifolii fallens*, and *Cymadothea trifolii*; and sweetclover to *Pseudopeziza melloti* and *Stagonospora melloti*.

Variation in cultures of certain grass smuts, W. J. MARTIN and M. F. KERNEAMP. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 8, pp. 761-763).—Culture of single-sporidial isolates of *Ustilago sphaerogena*, *U. neglecta*, *Sphecotheca panici-miliacei*, *Sorosporium syntherismae*, and individual promycelial-cell isolates of *U. crameri* on potato-dextrose agar and malt agar indicated that each species comprises a number of biotypes differing in one or more cultural characters. Many new biotypes were isolated from sectors arising in single-sporidial lines of each species.

Leaf rusts in North Dakota, W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 6, pp. 23-27, fig. 1).—This article briefly summarizes present knowledge of the leaf rusts of wheat, oats, barley, rye, corn, and flax.

Pythium graminicola Subr. on barley, W.-C. Ho, C. H. MEREDITH, and I. E. MELHUS (*Iowa Sta. Res. Bul.* 287 (1941), pp. 285-314, figs. 8).—*P. graminicola* was constantly isolated from infected barley roots in two Iowa localities (1936-39). The symptoms of infection were seed decay, seedling blight, root necrosis, yellowing and curling of leaves, and stunting. The root necrosis was very severe in 1936 and in 1938. Seedling injury was greater at high than at low temperature. The pathogen grew very slowly at 15° C, which may in part explain the larger yields of early seedlings. The pathogen is homothallic. Optimum temperature for mycelial growth in culture seemed to be 25°-30°, maximum 35°-40°, and minimum 5°-10°. The pathogen grew better in steamed alkaline Iowa soils such as Webster loam pH 8 than in acid soils such as Muscatine silt loam pH 5.3. It penetrates the root tips in a zone just back of the cap by a small penetration peg formed from a swelling on the hyphal tip. From this peg subsequent invasion progresses inter- and intracellularly and spreads into basal portions from the epidermis through the endodermis into the central cylinder. Plants growing in glass cylinders with the pathogen placed 2 cm. above the seed showed only slight root necrosis and some stunting of the plants, whereas in cylinders where the pathogen was placed below the seeds, severe root necrosis occurred. Of 10 barley varieties commonly grown in the Midwest, data obtained from both greenhouse and field tests indicated that Minsturdi seemed to possess more resistance than any of the others.

[Rice diseases in Louisiana]. (Coop. U. S. D. A.). (*Louisiana Sta., Rice Sta. Bien. Rpt.* 1939-40, pp. 25-32).—Included are reports of progress, by W. A. Douglas and T. C. Ryker, on studies of pecky rice and associated fungi; rice root rot associated with *Pythium* spp. and root maggots [water weevils] (*Lissorhoptus simplex*) and its control; and other rice diseases in Louisiana, including head smut, *Helminthosporium* leaf and glume spot, and *Cercospora* leaf spot and a resistant strain of Blue Rose rice.

Effect of the form of the available nitrogen on the calcium deficiency symptoms in the bean plant, J. SKOK (*Plant Physiol.*, 16 (1941), No. 1, pp. 145-157, figs. 3).—In these studies bean plants were grown with and without Ca, using nitrate N and urea. With Ca present, nitrate N produced better growth than urea, but without Ca much better growth was made with urea. With urea, the Ca-deficiency symptoms were much delayed and when developed were very much less severe. The Ca-deficient urea plants produced about 60 percent more growth than the Ca-deficient nitrate plants, and all of them flowered. Of the Ca-deficient urea plants, 25 percent produced fruit, whereas none of the Ca-deficient nitrate plants did so and only a few flowered. Roots of the Ca-deficient urea plants failed to exhibit the usual Ca-deficiency symptoms, and they produced twice as much growth as those of the Ca-deficient nitrate plants.

A histological study of snap bean tissues affected with black root, W. A. JENKINS. (Ga. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 11, pp. 683-690, pls. 4).—The peculiar external manifestation of such symptoms as differential streaking and wilting of certain plant parts is shown to be correlated histologically with differential necrosis of the phloem, cambium, and outermost layer of xylem in the root, hypocotyl, stem, and pod. Necrotic phloem symptoms varied from slight cytoplasmic disorganization in cells recently infected through stages of more or less complete cytoplasmic and nucleic destruction. In the end phases the cell contents resembled gum, and the cellulose cell walls became covered by suberin deposits. Callose pads were also noted in sieve tubes showing early symptoms. In the cambial zone contiguous to the

phloem conditions similar to those in phloem prevailed; in the areas nearest differentiating xylem, the symptoms most nearly resembled those characteristic of xylem. In the vessels very little evidence of plugging was observed except in the scalariform perforations, and very few tyloses were seen. The parenchyma around the youngest vessels contiguous to the cambium was severely necrosed, and necrosis was occasionally found in the ray parenchyma. It is tentatively suggested that the sudden wilting may be due to cessation of activity of the young vessels through destruction of the vital xylem parenchyma, to mechanical blocking of the scalariform perforations or to the phloem and cambium necrosis. Phloem necrosis extended throughout the vascular system of the pod and through the bundles of the funiculi into the seed coat at the chalazal end of the seed, but no evidence of infection was observed in the embryo. It is suggested that seed transmission may be accomplished by trans- fusion of the virus from the seed coat to the embryo, or that inoculation may occur as the germinating embryo ruptures the vascular system of the seed coat.

Differentiation of physiologic races of *Uromyces phaseoli typica* on bean, L. L. HARTER and W. J. ZAUMEYER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 12, pp. 717-731, pls. 3).—From bean rust material obtained from Hawaii and various parts of the United States, 20 physiologic races were differentiated on their reactions to 7 host varieties. Grades of infection were established on a 0-10 scale, immune varieties being graded 0 and the most susceptible ones 10, with grades 3-5 regarded as commercially resistant. The degree of infection was found to be influenced by environal conditions such as light, heat, and the length of day. Necrotic lesions characteristic of resistance could be detected on the underside of the leaf in about 3 days after inoculation, but the flecks later developing into large pustules were not evident before 5 days. The reactions of a large number of commercial varieties of beans were tested against races 1-14 of this rust. It was shown that 2-3 physiologic races may be present in one locality in a single year, the number of spores of 1 race usually predominating over the others. The same races do not necessarily recur in succeeding years in the same locality, but may be replaced by an entirely different combination of races. Urediospores remained viable for as long as 2 yr. when the leaves were dried and stored at -20° C.

The boron deficiency disease in cabbage, J. C. WALKER, J. G. McLEAN, and J. P. JOLIVETTE. (U. S. D. A., Wis. Expt. Sta., et al.). (*Jour. Agr. Res. [U. S.]*, 62 (1940), No. 10, pp. 573-587, figs. 6).—The symptoms in young cabbage plants grown in sand cultures in the greenhouse are described. In the field, plants seriously affected by internal break-down of the pith often showed no external sign of boron deficiency. Cauliflower was more susceptible to internal break-down on boron-deficient soil in Wisconsin than cabbage, kale, collard, or sprouting broccoli. Golden Acre and Resistant Detroit were the most susceptible cabbage varieties tested. One application of 20 lb. of borax per acre gave satisfactory but not perfect control for two successive cabbage crops. Soil application of salts of Mn, Cu, Fe, Zn, and Na were without effect on internal break-down. There are 27 references.

Ring necrosis of cabbage, R. H. LARSON and J. C. WALKER. (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 8, pp. 475-491, figs. 12).—This ring necrosis is described in comparison with other crucifer virus diseases. The virus infected all crucifers tested, including some 25 species and subspecies or botanical varieties, and certain other noncruciferous hosts, including sugar beet, chard, spinach, tobacco, *Nicotiana glutinosa*, *N. langsdorffii*, *N. rustica*, *N. repanda*, petunia, zinnia, and calendula. It was readily transmitted mechanically and by the green peach and cabbage aphids. The physical properties investigated were distinct from those reported for other crucifer viruses.

Bacterial wilt of corn, C. ELLIOTT (*U. S. Dept. Agr., Farmers' Bul. 1878 (1941), pp. [2]+21, figs. 13*).—This is a compendium of present knowledge on bacterial wilt of corn, including data on the distribution of the disease, the history of wilt epidemics, the symptoms on sweet and dent corn types, the causal organism (*Aplanobacter stewartii*=*Phytophthora stewartii*), overwintering of the bacteria in, and summer spread of infection by, the flea beetle vector, varietal resistance to infection (the only practical method of control), and the effect of weather on wilt development.

The effect of fruit rot of eggplant on seed germination, E. H. TOOLE, R. E. WESTER, and V. K. TOOLE. (*U. S. D. A.*). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 496-498, fig. 1).—In germination tests of two varieties of eggplant, seeds from healthy fruits germinated at a much faster rate and had a much higher final percentage of germination than those from diseased fruits. The bulk of seeds from healthy fruits had a very large proportion of heavy seeds with plump, hard surface, whereas those from the diseased fruits had an appreciably lower proportion of heavy seeds and many of these were shrunken and discolored.

Flax rust, H. H. FLOER. (*Coop. U. S. D. A.*). (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 6, pp. 7-9).—This article summarizes the author's investigations on flax rust (*Melampsora lini*), including a description of its life history, a discussion of the severity of the disease, and a statement of the progress being made in breeding for resistance and of the handicaps which may be encountered in such breeding operations.

The influence of certain cultural practices and disease control on yield of potatoes, L. M. HILL. (*W. Va. Expt. Sta.*) (*Amer. Potato Jour.*, 18 (1941), No. 5, pp. 121-131).—It was evident from the data obtained that if the individual cultural factors had been studied in separate experiments, the benefits resulting from early planting, certified seed, fertilizer, and bordeaux sprays would have been unquestionably established. It would by no means be clear, however, whether the gains associated with the individual factors were in themselves a true indication of the potentialities of the crop under various combinations of cultural practices. The results of this complex experiment demonstrate that having provided a favorable condition in respect to the study of one factor, it would be unwise to ignore or skimp other factors. On the contrary an adequate return on the investment made for certified seeds or fertilizer really depends upon due provision being made for early planting and spraying. All the sprays tested greatly increased the yield. The combination of calcium arsenate and bordeaux mixture was found superior to bordeaux and nicotine sulfate.

A method for the determination of losses due to diseased or missing plants, F. M. BLODGETT. (*Cornell Univ.*). (*Amer. Potato Jour.*, 18 (1941), No. 5, pp. 132-135).—Following a suggestion that the hills in a potato field could be grouped into a few classes as regards the effect of adjacent hills, it was evident that an estimate could be made of the loss in yield for any percentage of diseased or missing plants if the yield of the central hills in these different classes were determined and if the frequency of such different classes of hills could be estimated for any percentage of disease. The hills in a field could be classified as to whether they were healthy or diseased or were bordered on one or both sides by healthy or diseased plants. On these bases a statistical method of determining losses is presented.

Losses in yield caused by leaf roll of potatoes, C. S. TUTTILL and P. DECKER. (*Cornell Univ.*). (*Amer. Potato Jour.*, 18 (1941), No. 5, pp. 136-139).—"The data presented confirm the general opinion that leaf roll plants in a field do influence

the yield of a potato crop. The healthy hills bordered by leaf roll plants on one or both sides will, in part, make up in yield for the losses caused by the diseased plants. Since the yield varies with the change in percentage of leaf roll plants present, the binomial distribution outlined by Blodgett [in article noted on page 774] may be used to estimate how frequently healthy plants will occur with leaf roll plants on one or both sides in a random distribution. Therefore, there is a basis for estimating the loss in yield for any percentage of disease by determining the yield of the central plants in the six classes given. Even though this method has been tried only with leaf roll of potatoes it would seem to be equally applicable to nearly all other potato diseases transmitted through the tuber, as well as to missing hills, and to any row crop in which competition occurs between adjacent plants."

Actinomyces in potato tubers, B. F. LUTMAN. (Vt. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 8, pp. 702-717, figs. 9).—Studied in bits of young tuber skin mounted in glycerine and in sections stained with a modified Gram stain, infected lenticels showed a ring of brown cells with radiating strands of *Actinomyces* in surface view. In addition, patches of brown schizogenic spaces were to be observed. *Actinomyces* strands could be seen inside these spaces and in the intercellular middle lamella, the cells being split apart by the dissolution of the pectin. While infection takes place through stomata and lenticels, it seems to occur at any point on the skin where two cells join in very small tubers, 0.5-1 cm. in diameter. In sections of the white skin the hyphae do not produce schizogenic spaces, but in brown skin such spaces, filled with an exudate, occur under the cork. The entire tuber is infected by hyphae inside the cell walls, the filaments appearing to be continuous from the outer layer of cork to the center of the tuber. Since the scab organism lives on pectin, it was cultured on a pectin-jelly medium. Growth was very profuse, white, with numerous conidia, and the medium was liquefied.

Potato scab, W. H. MARTIN and R. H. DAINES (*New Jersey Stat. Cir.* 415 (1941), pp. 10).—A discussion of the disease caused by *Actinomyces scabies* and its practical control based on years of study and observation under New Jersey conditions. Seed-potato treatments, rotation of badly infested soil to other crops for a period of years, use of acid-developing fertilizers, plowing under of green manure, and some other measures are discussed, but the major control method recommended is the broadcast application of sulfur dust (about 200-mesh) just after spring plowing, followed by thorough harrowing in, using up to 500 lb. per acre depending on soil type.

Varietal susceptibility of potatoes to Fusarium wilt, R. W. GOSS and J. H. JENSEN. (Nebr. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 7, pp. 209-212).—In field tests at Scottsbluff, Nebr., with irrigated soil inoculated with *F. solani eumartii*, the amount of wilt infection was much greater in 1940 than in 1939. With one exception, Houma, the varieties arranged themselves similarly in both years with respect to resistance. Pontiac, Katahdin, Golden, and Sebago, along with the hybrids B5 and B4-1, proved least susceptible of any of the new varieties tested. White Rose, Earlane, and Chippewa were much more susceptible than these, whereas Mesaba and Warba were even more susceptible than Cobbler and Triumph which were used as susceptible checks. All of these very susceptible varieties are held undesirable for sections where *Fusarium* wilt is prevalent. Of four German varieties Erstling was as susceptible as the checks. Arnica was much less susceptible. Hindenburg showed less infection than any American varieties. In 3 years' field tests Jubel showed no infected or questionable plants or tubers, being more resistant also in greenhouse trials than any other variety

tested. Houma, one of the varieties least infected in 1939, was one of those worst infected in 1940.

Reduced toxicity of cuprous oxide to *Phytophthora infestans* (Mont.) DeBary by the addition of certain insecticides, J. B. SKAPTASON and F. M. BLODGETT. (Cornell Univ.). (*Amer. Potato Jour.*, 18 (1941), No. 6, pp. 179-180).—The results of a large-scale factorial design field test in which 6-row plats were dusted six times with all possible combinations of pyrethrum, rotenone, sulfur, and cuprous oxide indicated that addition of certain materials to cuprous oxide was followed by an increase in late blight lesions, i. e., an apparent reduction in toxicity of the Cu. Statistical analysis of the data, however, showed that only in the case of pyrethrum was the increase in blight counts significant. From similar studies in the past it was concluded that in no case did the addition of cuprous oxide reduce the toxicity of the insecticide used.

Late blight of potato, J. H. MUNCE (Mich. State Col. Ext. Bul. 226 (1941), pp. 7, figs. 3).—A practical account.

Bacterial ring rot of potato, J. H. MUNCE (Mich. State Col. Ext. Bul. 227 (1941), pp. 7, figs. 6).—A practical account.

Results of attempted eradication of bacterial ring rot from potatoes, D. P. GLICK. (Colo. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 5, pp. 140-143).—Results of the first year's increase, comprising 27,400 hills planted with 21 selected lots of seed potatoes, upon which the microscopic method was used in an attempt to eradicate bacterial ring rot, are presented. The method was apparently successful in all lots except for 9 hills out of 4,000 of the Katahdin variety. The ultraviolet light method did not yield results that are comparable in accuracy to the microscopic method for research purposes.

Hosts of the sugar cane gumming disease organism, G. ORIAN (*Rev. Agr. Maurice*, 20 (1941), No. 1, pp. 19-58, pls. 7; *Fr. abs.*, p. 58).—The spontaneous hosts of *Bacterium* (= *Phytonomas*) *vascularum* on Mauritius are reported to be corn, a palm (*Dictyosperma album*), and the "broom bamboo" (*Thysanolaena maxima*). Jobs-tears (*Colea lacryma-jobi*), Guinea grass (*Panicum maximum*), tall bamboo (*Bambusa vulgaris*), and the coconut palm (*Cocos nucifera*) became infected from artificial inoculation. The characters and reactions of the bacterium isolated from corn, sugarcane, palm, and *Thysanolaena* are presented.

Soft rot of sweet potatoes, R. H. DAINES (*N. J. Agr. [Rutgers Univ.]*, 23 (1941), No. 3, p. 2).—The symptoms and control of the soft rot due to *Rhizopus* are briefly presented. So successful was borax shown to be in preventing soft rot that markets previously closed to certain sweetpotatoes have begun to accept them and sometimes at a premium.

Pre-market sweet potato dips: Effect on soft rot, shrinkage, and appearance (*New Jersey Sta. Plant Disease Notes*, 18 (1941), No. 12, pp. 45-48).—Of the combinations of borax, bicarbonate of soda, sodium sulfide, sodium polysulfide, calcium polysulfide, finely ground sulfur, soluble and insoluble coppers (etc.) tested, the best three-purpose dip consisted of wax, borax, and oil (1 gal. wax emulsion, 4 gal. water, and 1 lb. borax). A cheaper but slightly less satisfactory substitute was a combination of 2 gal. of 86 percent semirefined, summer spray type emulsified oil with viscosity of 70 Saybolt sec., 20 lb. of borax, and 98 gal. of water.

Tobacco diseases in 1940 (*Connecticut [New Haven] Sta. Bul.* 444 (1941), pp. 265-269).—This is a seasonal report on diseases, with special reference to downy mildew, including control experiences. The total damage by other diseases is said to have been practically negligible.

Acetyl and phenylureido derivatives of tobacco mosaic virus, G. L. MILLER and W. M. STANLEY (*Science*, 93 (1941), No. 2418, pp. 428-429, fig. 1).—

Evidence was obtained that infecting virus molecules may not necessarily function as exact patterns for reproduction. The results of the study as a whole indicate that the propagation of normal virus did not arise from unchanged virus present in the preparations of the derivatives and demonstrate that a large proportion of certain functional groups of the virus molecule may be altered without interfering with the basic reaction of virus reproduction.

Correlation of activity per unit weight of tobacco-mosaic virus with age of lesion. E. L. SPENCER (*Science*, 94 (1941), No. 2430, pp. 96-97).—Experiments with tobacco mosaic on Turkish tobacco clearly indicate that the virus in young lesions displays on a unit basis only a fraction of its potential biological activity and that such virus may vary somewhat in size and shape from virus isolated from older lesions. Experiments also indicate that N may be an important factor in increasing the activity per unit weight of virus in vivo, and preliminary studies have shown that it may even be possible to increase this unit activity in vitro by supplying the virus with suitable forms of N.

Effect of manganese deficiency upon the histology of *Lycopersicon esculentum*. E. T. ELTINGE (*Plant Physiol.*, 16 (1941), No. 1, pp. 189-195, figs. 3).—Mn-deficiency in a plant first affects the chloroplasts, which become yellowish green, gradually lose their starch grains, become vacuolated, then granular, and finally disintegrate. Affected plastids dissolve in dilute soap solution and produce little if any ascorbic acid. The cytoplasm eventually turns brown. Affected leaves are thinner and have smaller palisade cells, and many more cells contain large masses of crystals (true also of stems) than in normal leaves. Mn-deficient stems are smaller in diameter and contain less xylem, which is often plugged with coagulated material. Some of the conducting cells in the leaf veins are also plugged, but by both crystals and coagulated material. Some of the nutrient material stored in affected leaves is in the form of fat. That in stems is in the form of starch, but the grains are mostly simple and fewer in number as contrasted with healthy stems.

A study of certain viruses pathogenic to the tomato. R. W. SAMSON. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 55 (1939), pp. 77-83, figs. 4).—"A number of viruses or strains of viruses of the tobacco mosaic group occur on canning tomatoes in Indiana. This conclusion is based on symptoms produced by various collections of these viruses and by their complementary action with the so-called healthy potato virus or virus B in the production of tomato streak. Likewise, it appears that there are a number of viruses and strains of the virus B group, two of which are described in some detail. The differences in the extent to which the viruses of these two groups invade Jimson weed, Black Beauty eggplant, certain potato seedlings or clones, and pepper provide a means of their separation from a streak complex. The variety of forms and relative abundance of these viruses as they occur in Indiana justify additional investigations now under way." There are 43 literature references.

Buckeye rot of tomato in California. C. M. TOMPKINS and C. M. TUCKER. (Calif. and Mo. Expt. Stas.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 8, pp. 467-474, figs. 2).—Buckeye rot of green tomato fruits, prevalent in several of the interior valleys of central California, is favored by high temperatures and humidity. The most important condition for infection there appeared to be contact of the fruit with moist soil or irrigation water. The disease in California was found to be due to *Phytophthora capsici* and *P. drechsleri*, rather than to *P. parasitica*. The several differential hosts (e. g., pumpkin and bell pepper fruits and carrot and turnip roots) found may assist in identifying *Phytophthora* species isolated from diseased tomato fruits. There are 40 references.

Effect of root-knot nematode on tomato wilt, A. L. HARRISON and P. A. YOUNG. (Tex. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 8, pp. 749-752, figs. 4).—Losses from wilt were found greater on tomatoes following root knot-susceptible cowpeas than following root knot-resistant peanuts. The evidence also indicated that this nematode reduces the wilt resistance of many varieties of tomatoes. A wilt-immune selection retained its immunity despite the abundance of *Heterodera marioni*.

Water culture experiments on molybdenum and copper deficiencies of fruit trees, D. B. HOAGLAND. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 8-12, figs. 3).—From the present experiments (1938, 1940) on Myrobalan plum seedlings grown in nutrient solutions in 4-l. pyrex beakers with repurified salts and redistilled water, the essentiality of Cu and Mo was demonstrated and the symptoms of deficiencies in these elements are described. It was further observed that in the latter part of the season plants growing in a solution containing 26 elements added to the basic solution appeared superior in growth and color of leaves to those growing in solutions with only the 5 elements B, Cu, Mn, Bn, and Mo added. The possibility is thus not excluded that additional elements may be shown to be essential.

Recent research on diseases of fruit trees and bushes in Britain, H. WORMALD (*Brit. Mycol. Soc. Trans.*, 25 (1941), pt. 1, pp. 4-25).—An address reviewing studies on orchard and small fruits (76 references).

Studies on bitter pit of the apple, R. M. SMOCK ([*New York*] *Cornell Sta. Mem.* 234 (1941), pp. 45, figs. 8; *abs. in Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 7).—Applications of N during the growing season to trees at a low N level and injections or urea into single limbs apparently increased the bitter pit susceptibility of apple fruits. These N applications increased the osmotic concentration in the leaves more than in the fruits. Ringing seemed to increase susceptibility of pitting markedly, and it also increased the osmotic value of the leaves proportionally more than that of the fruits. Defoliation, removing leaf-fruit competition for water, was the only orchard treatment that seemed to reduce susceptibility to pitting. Partial girdling of the fruit stems during summer increased the susceptibility to pitting, and presumably increased the osmotic concentration of the leaves at the expense of the fruits. Fruits on heavily thinned limbs and on naturally light-crop trees were more susceptible to pitting. These conditions were also accompanied by increased osmotic value of the leaves at the expense of the fruits. Lateral fruits of clusters on unthinned limbs were more likely to pit than the terminal fruits. Shading of limbs during the growing season resulted in increased susceptibility to pitting. Delayed storage is likely to result in hastening the appearance of bitter pit. Controlled-atmosphere storage delayed the appearance of bitter pit but did not reduce the final amount. High relative humidities in storage materially checked its rate of development. There is a suggestion that, at least under some conditions, the use of shredded oiled paper may increase the amount of bitter pit on fruits in storage, whereas waxing of fruits with certain emulsions seemed to delay its appearance materially. There are 30 references.

The effect of leafhopper injury on the rates of apparent photosynthesis and transpiration of Stayman Winesap apple leaves, N. F. CHILDERS, G. E. MARSHALL, and H. W. BRODY. (Ohio State and Purdue Univs.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), p. 165).—An abstract.

New methods for scab control—is the new spray on the soil of value? K. J. KADOW and S. L. HOPPERSTEAD. (Univ. Del.). (*Md. State Hort. Soc. Proc.*, 43 (1941), pp. 66-75, figs. 2).—From experiments in Delaware and results reported in other parts of the country, the conclusions are believed justified

that ground spraying properly done greatly reduces the primary inoculum of apple scab and is beneficial as an extra control measure where the disease has not been held in check the previous season. Delaware tests failed to indicate a difference in value between the two sodium dinitro-o-cresylate sprays or the sodium nitrate plus calcium arsenite sprays used. Ground sprays are likely to fail unless followed by a well-timed, thoroughly applied sulfur spray schedule, though apparently milder sprays may be used. Because of the ascospore drift, grower test plats should never be smaller than 1,000 ft. square unless completely isolated.

Relations of nectar concentration to growth of *Erwinia amylovora* and fire blight infection of apple and pear blossoms, S. S. IVANOFF and G. W. KERR. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 12, pp. 733-743).—The optimum sugar concentration for growth of *E. amylovora* in $\frac{1}{100}$ -cc. drops of artificial nectar in Van Teighem cells was 2-4 percent. Growth decreased rapidly with increased sugar concentration, none occurring at 30 percent. The bacteria survived for 48 hr. in similar drops containing 20 percent of sugars, 24 hr. in 30 percent, and less than 24 hr. in 40 or 50 percent. When tubes of artificial nectar containing 40 percent of sugars were heavily seeded, the bacteria survived and were still infective at 72 hr. Approximately 10 bacteria in a $\frac{1}{100}$ -cc. water drop constituted an effective inoculum when placed in dilute nectar of pear blossoms. Abbé refractometer readings are reported for nectar of pear, apple, and crab apple (*Malus coronaria*) collected under various conditions in nature, with record of time, temperature, and relative humidity. Infection of unwounded pear or apple blossoms inoculated by placing small drop-lets of bacterial suspension in the nectar occurred freely only when the sugar concentrations were in the lower range encountered in natural nectar. Sharp inhibition or prevention of infection occurred at the lower intermediate concentrations. There was usually no infection at the medium or higher concentrations, which predominated in the orchard readings, but infection occurred if the concentrated nectar was sufficiently diluted soon enough after inoculation.

Transmission of fire blight by bees and its relation to nectar concentration of apple and pear blossoms, G. W. KERR and S. S. IVANOFF. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 12, pp. 745-753, fig. 1).—Transmission by honeybees of fire blight (*Erwinia amylovora*) of apple and pear was studied by three methods, the most flexible and convenient one employing individual bees handled in a specially designed wire cage. Bees were attracted to blighting blossoms inoculated 5 days before, and transmitted the disease to healthy blossoms. In greenhouse and orchard tests contaminated bees freely transmitted blight to healthy blossoms when the sugar concentration of the nectar was in the lower range encountered in nature, but not when it was in medium or higher ranges. Nectar concentration proved an important factor in limiting blossom blight transmission by bees, but in many cases of favorable concentration little or no infection occurred from contaminated bees. It is thus apparent that other factors besides nectar concentration are influential in limiting blossom blight transmission by bees.

Brown rot on stone fruits in western Washington, G. A. HUBER and K. BAUR. (West. Wash. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 8, pp. 718-731, figs. 5).—*Sclerotinia laxa* and *S. fructicola* were found responsible for this trouble in western Washington. Isolations from apricot gave *S. laxa* from twigs, cankers, blossoms, and fruit, and *S. fructicola* from fruit only; from cherry, *S. laxa* from mummies, fruit spurs, cankers, blossoms, and fruit, and *S. fructicola* from blossoms and fruit; from peach, *S. laxa* from mummies, twigs,

cankers, blossoms, and fruit, and *S. fructicola* from mummies and fruit; and from prune, *S. laxa* from mummies, fruit, and twigs, and *S. fructicola* from mummies (0.3 of 1 percent), apothecia, blossoms, shedders, fruit (green and mature), and twigs to which mummies were attached. An unidentified organism was obtained from shedders, mature fruit, and twigs to which mummies were attached. Both Sclerotinias caused blossom blight on apricot, cherry, and peach, but, although causing infection of various floral parts of Italian prune, no infection was observed to develop into and down the pedicels. *S. laxa* caused definite twig cankers on apricot, cherry, and peach, but not on Italian prune. Inoculations with *S. fructicola* failed to produce definite cankers. Both species caused decay in fruit of apricot, cherry, peach, and Italian prune.

Mottle leaf, a virus disease of cherries, E. L. REEVES. (U. S. D. A.). (Jour. Agr. Res. [U. S.], 62 (1941), No. 9, pp. 555-572, figs. 8).—Mottle-leaf, transmitted artificially only by grafting or by some adaptation of the process, has been observed on cherry trees in Washington, Oregon, Idaho, California, and British Columbia, and has probably been in the Pacific Northwest for over 20 yr. The leaves exhibit the most conspicuous symptoms, in which considerable variation was found among cherry varieties. Only 4 varieties have been found with mottle-leaf symptoms in the field, and Bing and Napoleon are the 2 most important commercial varieties displaying severe leaf symptoms. Of 19 varieties inoculated, none proved immune to mottle-leaf, although many were tolerant and showed very slight leaf symptoms. Attempts to transmit the disease to other stone fruits have been mostly unsuccessful because of the failure to form a growth union, but a preliminary greenhouse experiment demonstrated that the virus is transmissible through tissues of the peach. It was transmitted by budding from cherry to cherry, producing definite symptoms in 14 days on trees in the greenhouse and in 37 days in the field, and by any method where growth union was established. No mechanical method tried was successful, and the manner in which mottle-leaf spreads in the field is unknown. Tests with the black cherry aphid (*Myzus cerasi*) gave negative results. Hot-water treatment of bud sticks at 46° C. for 60 min. and at 49° for 10 min. failed to inactivate the virus. There is no record of a tree having recovered from the disorder once the leaves definitely exhibit mottle-leaf symptoms. It is suggested that affected cherry trees be removed to prevent spread of the disease. Cherry disorders causing leaf malformations sometimes confused with mottle-leaf are briefly described.

Blister rust studies of three patches of red currants in New York, W. H. SNELL (Phytopathology, 31 (1941), No. 8, pp. 732-740, fig. 1).—From the standpoint of the white pine blister rust, the most important aspect of any *Ribes* species is its susceptibility to the fungus and the consequent potential volume of inoculum. As for the relatively resistant red currants, only 1-2 bushes in a row of 6-12 were more than very slightly, if at all, infected, infected leaves were dropped very early in the summer, and the bushes were defoliated much earlier than black currants or wild gooseberries, and the earlier, the more infected they were. In two lots of neglected currants growing on abandoned farms, 75-96 percent of the infection spots were necrotic before the end of July 1940 before telia and sometimes even uredia could be produced. Furthermore, 95 percent of the telia were only 22-50 percent as long as those considered normal for red currant, and most of these apparently were dead. On the bushes of these same two patches, the earlier-formed, dead infection spots were 0.0112 sq. in. in area, whereas the fresh, live spots averaged about 0.0036 sq. in., with some of them so small that they bore only a single uredium.

A preliminary study of chlorosis in American grapes, L. R. BRYANT and G. A. BEACH. (Colo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 395-396).—As part of a study of grape variety adaptation at Fort Collins, Colo., data are presented on the resistance or susceptibility of 42 varieties to the "iron-deficiency" type of chlorosis, with suggestions as to those well adapted to this area.

A bacterial pathogen of the citrus red scale, V. P. SOKOLOFF and L. J. KLOTZ. (Univ. Calif.). (*Science*, 94 (1941), No. 2428, pp. 40-41).—A preliminary report on a sporiferous, nitrate-reducing motile bacterium isolated from the soil and a similar or identical one from dead red scale causing in some cases a mortality as high as 100 percent.

An evaluation of the results of treatments given narcissus bulbs for the control of the nematode *Ditylenchus dipsaci* (Kühn) Filipjev, B. G. CHITWOOD and F. S. BLANTON. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 31 (1941), No. 7, pp. 296-308).—The results of narcissus bulb treatments for *D. dipsaci* over a 9-yr. period are presented. All were modifications of the hot-water and vapor-heat treatments. Treatment for 4 hr. in 0.5 percent formalin at 110° F. is the best treatment known today and is recommended for all stocks containing a residuum of bulbs infected with *D. dipsaci*. Estimates of efficacy should be based on binomial distribution formulas. Considerable numbers of bulbs should be examined individually. Hot-water and vapor-heat treatments require relatively high temperatures or long durations to be effective.

The effects of several spray materials on the apparent photosynthesis of the greenhouse rose, D. C. KIPLINGER and A. LAURIE (*Ohio Sta. Bimo. Bul.* 210 (1941), pp. 105-119, figs. 7).—The data presented indicate that combinations of rotenone and oil; rotenone and glycerol; rotenone, pyrethrum, and oil; pyrethrum and soap; and oil or soap alone caused an immediate reduction in the expected rate of apparent photosynthesis in the Better Times rose. The severity of reduction varied with the composition of the spray material.

Distribution by the sap stream of spores of three fungi that induce vascular wilt diseases of elm, W. M. BANFIELD. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 11, pp. 637-681, figs. 9).—*Ceratostomella ulmi* spore suspensions were injected in relatively large volumes at stump height or into the tops of American elms of various sizes during all seasons of the year, the trees being afterwards felled and cut at once into 3- to 20-ft. sections. The spore distribution was then determined by (1) their presence in centrifuged sap and water displaced from 3- or 4-ft. sections of stem cut from various parts of the trees or (2) by the conspicuous brown discoloration induced in elm vessels at those points occupied by *C. ulmi*. The rate of spore distribution in the vessels was checked from observations of the movement of brightly colored colloids or stained spores subsequent to injection into similar trees from which the bark had been removed immediately before. Spores were distributed in the outermost ring of large vessels throughout most of the stem structure in trees injected stump high for 20 min. to 48 hr. in the early part of the leafy season. The average distribution was 10.7 ft. in 9 small trees averaging 12.9 ft., and 44.3 ft. in 23 tall trees averaging 49.6 ft. in height.

Verticillium dahliae and *Dothiorella* (*Ophalosporium*) *ulmi* were recovered within 1-11 ft. of the tops of 6 23- to 44-ft. elms 6 and 7 days, respectively, after injection of a few cubic centimeters of spore suspension at stump height. Injected in large volumes of spore suspension 40-41 ft. above the stump at points where the stem was 4.5 in. or more in diameter, *C. ulmi* was recovered at stump height in leafy trees felled at the close of 15- or 20-min. injection periods.

Spores were not distributed in the smaller vessels of the wood more than 18 in. above or below injection points at any season of the year in tests wherein the injection time was 2 days or less. During the latter half of the leafy season spore distribution averaged three-tenths the height of 25 13- to 60-ft. trees injected at stump height for 1-4.2 hr. and the maximum distribution was half their height. Spores were identified in sap displaced from various points in the boles or crowns of spontaneously infected and inoculated trees showing wilt symptoms in June, July, and September. During the nonleafy season *C. ulmi* could not be recovered at more than 24 in. above injection points in 12 trees injected at stump height and felled 1 hr. to 28 days thereafter. The distribution of *C. ulmi* from points at which it was placed in contact with wood injuries without free water occurred more slowly and was highly variable. From such inoculation points in top branches 0.5-1.75 in. in diameter at the inoculation point, distribution varied from 1.5 ft. to the entire branching structure and bole of 25 trees 27-50 ft. high 4 mo. after inoculation. Highly colored suspensoids and stained yeast cells were observed to move through the outermost ring of vessels at relatively fast rates from injection points in large, standing, leafy trees. These suspensoids usually ascended the first 5 ft. in 8-15 sec., reached a maximum of 20 ft. in less than 10 min., descended with like speed, and reached a maximum distribution of 36 ft. in 6 min.

Comparison of susceptibility of the American elm and several exotic elms to *Ceratostomella ulmi*, S. J. SMUCKER. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 8, pp. 758-759).—The results of inoculations of seedlings (one exception) of *Ulmus americana* and several exotic species of elm from $\frac{3}{8}$ to $1\frac{1}{4}$ in. in diameter at the base are presented. The population of American elm proved more susceptible to the Dutch elm disease than any others tested, while the *U. pumila* group appeared rather resistant and as a whole escaped serious injury from the disease.

New fungus disease caused by *Cytospora* threatens Chinese elm trees of Colorado, J. L. FORSBERG (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 3, pp. 3-4, figs. 2).—This note calls attention to a disease killing Chinese elms, due to a *Cytospora* which enters the tree through wounds or breaks in the bark. Trees entering winter in too soft a condition appear to be more subject to infection and hence should not be watered too heavily in the fall.

Fusarium die-back of American holly, T. R. BENDER (*New Jersey Stas. Nursery Disease Notes*, 13 (1941), No. 12, pp. 45-48; 14 (1941), No. 1, pp. 4).—A disease of *Ilex opaca* causing considerable disfigurement but seldom killing the tree is shown to be due to a special pathogenic form of *F. solani martii*.

A blue stain fungus, *Ceratostomella montium* n. sp., and some yeasts associated with two species of *Dendroctonus*, C. T. RUMBOLD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 62 (1941), No. 10, pp. 589-601, figs. 5).—The sapwood of *Pinus contorta latifolia*, *P. monticola*, *P. ponderosa*, and *P. flexilis* trees infested with the bark beetles *D. monticolae* and *D. ponderosae* was found to be stained by a new fungus, *C. montium* n. sp., here described. This fungus has large perithecia and box-shaped spores, is sensitive to high temperatures, and its growth is stimulated by the two types of yeasts, *Zygosaccharomyces* and *Monilia* spp., found growing with *C. montium* in the insect galleries. There are 20 references.

The seedling test method for root-knot-nematode resistance, D. M. BAILEY. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 573-575).—In tests of 5 species of *Lycopersicon* by the potted seedling method, detailed procedure for which is described, 95 commercial varieties and selections of the common tomato from experimental laboratories, and, with 3 possible excep-

tions, 420 seed lots from the U. S. D. A. Bureau of Plant Industry failed to show tolerance. *L. glandulosum*, *L. hirsutum*, and *L. pimpinellifolium* also proved susceptible, but *L. peruvianum* appeared to be more tolerant to *Heterodera marioni* and selections from this species gave considerable promise. The ability of nematodes to adapt themselves to new host species justifies a conservative attitude, but these tests indicate that there are possibilities for the breeding of tolerant varieties.

Use of chloropicrin for root knot nematode control (*New Jersey Stat. Plant Disease Notes*, 18 (1941), No. 11, pp. 41-44).—For greenhouse, coldframe, or small outdoor plats the chloropicrin should be applied to the soil by injecting 2-3 cc. into the soil to a depth of 4-5 in., making an injection for every square foot. This amount is about 7.3-11 lb. per 1,000 sq. ft. of soil surface. After the entire area has been treated the soil should be covered with sash, paper, wet burlap, a layer of wet straw, or other material to hold in the gases.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Michigan trappers, D. W. HAYNE (*Michigan Sta. Spec. Bul.* 307 (1941), pp. 34, figs. 6).—Report is made of a study commenced in 1938 which consisted of an examination of the importance of the fur crop to farmers and other occupational groups in the State. In a study of their occupations, use was made of the trappers' license reports for the season 1937-38, the first year that they were required by the State, and a personally conducted questionnaire survey of Williamston Township, Ingham County. The region of the State in which the trapping was done appeared to have as little effect on the average income as did the occupation of the trapper. Farm boys and men were found to be the most numerous trappers, and both as trappers and as landowners are considered to control the future of the fur resources of Michigan. A list of 14 references to the literature cited is included.

White-tailed deer foods of the United States, E. L. ARWOOD. (Univ. Wis.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 3, pp. 314-332, fig. 1).

The food of small forest mammals in eastern United States, W. J. HAMILTON, JR. (Cornell Univ.). (*Jour. Mammal.*, 22 (1941), No. 3, pp. 250-263).—Presented with a list of 29 references to the literature.

Factors causing rodent damage to tree plantations in southeastern Minnesota, L. A. PARKER. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 3, pp. 297-303).

Controlling rodents and other small animal pests in Oregon, I. N. GABRIELSON (*Oreg. State Col. Ext. Bul.* 553 (1941), pp. 23, figs. 2).—A practical account.

Lymphadenitis in New York cottontails, E. L. CHEATUM (*Jour. Wildlife Mangt.*, 5 (1941), No. 3, pp. 304-308, pl. 1).—An infection of the lymph system of cottontail rabbits is described and the distribution of necrotic foci recorded. The causative organism was identified as a strain of *Staphylococcus aureus*. The infection is thought to gain entrance through a skin injury. Field and laboratory experience does not indicate intrinsic fatality of the lymphadenitis, although possible inaccessibility of the more gravely affected rabbits may prevent accurate evaluation of its importance as a factor in losses in the wild.

The owls of New Jersey, L. A. HAUSMAN (*New Jersey Stat. Bul.* 690 (1941), pp. 36, figs. 21).—This, the twelfth of a series of bulletins by the author on the birds of New Jersey (E. S. R., 83, p. 650), treats of 10 species of owls that occur in the State. A general introductory account of owls and a table of the nesting of native species are followed by descriptions of the male and female, food and economic importance, occurrence in the State, and identification of each of the

10 species. The bulletin concludes with a discussion of owls and the meadow mouse and a field and specimens-in-hand key of the native species.

A study of the fall food supply of the ring-necked pheasant and the bob-white quail in Washington County, Rhode Island, T. WRIGHT, JR. (R. I. Expt. Sta.). (*Jour. Wildlife Mgmt.*, 5 (1941), No. 3, pp. 279-296).—Report is made of a study commenced in the fall of 1937 and continued through 1938 and 1939 for the purpose of determining the foods eaten by these species, as well as the chemical composition of the plant items taken. Details of the findings, presented in six tables, showed that the ring-necked pheasant, often a predominantly granivorous bird in Rhode Island, obtains less than 40 percent of its food from grain. The bobwhite consumes large quantities of weed seeds, but the proportion revealed by this study was less than that found in other investigations. Availability for the most part determined the relative percentages of various items of food taken by the pheasant and quail. A list is given of 22 references to the literature.

The toxicity of *Crotalaria spectabilis* seeds for quail, R. B. NESTLER and W. W. BAILEY. (U. S. D. A. et al.). (*Jour. Wildlife Mgmt.*, 5 (1941), No. 3, pp. 309-313).—The seeds of *C. spectabilis*, a legume grown as a cover crop, are poisonous to bobwhites, but under ordinary conditions are not eaten by birds when there is a choice of feeding stuffs.

Protozoa in biological research, edited by G. N. CALKINS and F. M. SUMMERS (New York: Columbia Univ. Press, 1941, pp. XLI+1148, pls. 4, figs. 226).—This is a presentation in 20 chapters, prepared by many specialists including the editors, as follows: General Considerations, by G. N. Calkins (pp. 3-42); Some Physical Properties of the Protoplasm of the Protozoa, by H. W. Beams and R. L. King (pp. 43-110); Cytoplasmic Inclusions, by R. F. MacLennan (pp. 111-190); Fibrillar Systems in Ciliates, by C. W. Taylor (pp. 191-270); Motor Response in Unicellular Animals, by S. O. Mast (pp. 271-351); Respiratory Metabolism, by T. L. Jahn (pp. 352-403); The Contractile Vacuole, by J. H. Weatherby (pp. 404-447); The Technique and Significance of Control in Protozoan Culture, by G. W. Kidder (pp. 448-474); Food Requirements and Other Factors Influencing Growth of Protozoa in Pure Cultures, by R. P. Hall (pp. 475-516); The Growth of the Protozoa, by O. W. Richards (pp. 517-564); The Life Cycle of the Protozoa, by C. A. Kofoed (pp. 565-582); Fertilization in Protozoa, by J. P. Turner (pp. 583-645); Endomixis, by L. L. Woodruff (pp. 646-665); Sexuality in Unicellular Organisms, by T. M. Sonneborn (pp. 666-709); Inheritance in Protozoa, by H. S. Jennings (pp. 710-771); The Protozoa in Connection With Morphogenetic Problems, by F. M. Summers (pp. 772-817); Certain Aspects of Pathogenicity of Protozoa, by E. R. Becker (pp. 818-829); The Immunology of the Parasitic Protozoa, by W. H. Talliaferro (pp. 830-889); and Relationships Between Certain Protozoa and Other Animals (pp. 890-1008) and Organisms Living on and in Protozoa (pp. 1009-1113), both by H. Kirby, Jr. A copious list of references accompanies each chapter, and an index is included.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 372, 415, 467-477, figs. 5).—Contributions presented (El. S. R., 85, p. 502) are: Insect Food of Bullock Oriole, by G. F. Knowlton (p. 372) (Utah Expt. Sta.); *Megamelus davisii* Infesting Water Lily in Hawaii, by S. H. Au (p. 415); Proportion of the Sexes in June Beetles in Wisconsin, by T. R. Chamberlin and L. Seaton (p. 467) (U. S. D. A.); Effect of pH on Toxicity of Certain Antimony Compounds to the Greenhouse Thrips, by C. O. Persing, B. R. Bartlett, and R. L. Beier (p. 468) (Univ. Calif.); *Dyslobus tanneri* Van Dyke, a Pest of Apple in the Northwest, by M. A. Yothers (pp. 469-470) (U. S. D. A.); Dust as an Inhibiting Factor in the Reproduction of Insects, by S. E. Flanders (pp. 470-472) (Univ.

Calif.) ; A Maggot [*Hylemya abdena*] Attacking Carnation Shoots, by C. F. Doucette (p. 472) (U. S. D. A.) ; Control of Tulip [Bulb] Aphids on Southern Iris, by L. G. Utter (p. 473) ; Concentrations of Derris Sprays Effective on the Imported Cabbage Worm (pp. 473-474) and Field Trials With Two New Contact Insecticides (p. 474), both by L. Pyenson and R. W. Roth ; Effect on Amaryllis Bulbs of Hot Water and Cyanide Used in Control of [Narcissus] Bulb Fly Larvae, by F. S. Blanton (p. 475), Type of Wood Preferred by Coleoptera Commonly Found in Decadent Parts of Living Elm Trees, by W. C. Baker (pp. 475-476), Variations in the Composition of Paris Green, by R. H. Carter and C. M. Smith (pp. 476-477), and An Unusual Infestation of Cabbage Aphids (*Aphis brassicae* L.), by R. E. Campbell (p. 477) (all U. S. D. A.) ; and The Ridging of Citrus Fruits as Influenced by Fumigation of Citrus Trees with HCN, by D. L. Lindgren and W. B. Sinclair (p. 477) (Univ. Calif.).

[Seventieth and seventy-first annual reports of the Entomological Society of Ontario, 1939 and 1940] (*Ent. Soc. Ontario, Ann. Rpts.*, 70 (1939), pp. 133, figs. 32; 71 (1940), pp. 64, figs. 7).—Among the contributions presented at the annual meeting of the society held at Quebec City in November 1939 (E. S. R., 82, p. 647) are the following: The Potato Aphid Survey in New Brunswick and Adjacent Provinces, by R. P. Gorham (pp. 23-25) ; Preliminary Notes on the Life-History and Biology of the Tobacco Worm (*Phlegethonius quinque-maculata* Haw.) in Ontario, by G. M. Stirrett and A. A. Wood (pp. 25-27) ; Further Notes on Corn Borer Resistance in Hybrid Corn, With a Brief Statement of the Infestation Situation in Ontario in 1939, by R. W. Thompson (pp. 27-30) ; A Test of Sodium Fluoride Bait in the Control of the European Earwig in Ontario, by A. G. McNally (pp. 30-33) ; The Plum Nursery Mite *Phyllocoptes fockeui* Nal. and Trt., by W. L. Putman (pp. 33-40) ; The Plum Leafhopper (*Macropsis trimaculata* Fitch) in Ontario, by T. Armstrong and W. L. Putman (pp. 41-48) ; Notes on *Lampronia rubiella* Bjerk, a Raspberry Pest New to North America, by C. W. B. Maxwell and F. T. Lord (pp. 49-51) ; Biological Control of Insect Pests in Canada, With Special Reference to the Control of the European Spruce Sawfly (*Gilpinia polytoma* Htg. [= *Diprion polytoma* (Htg.)]), by A. B. Baird (pp. 51-56) ; An Exchange of Grasshopper Parasites Between Argentina and Canada, With Notes on Parasitism of Native Grasshoppers, by C. W. Smith (pp. 57-62) ; Biological Control of Greenhouse Insect Pests, by J. H. McLeod (pp. 62-68) ; Biological Control of the Pea Moth (*Laspeyresia nigricana* Steph.), by G. Wishart (pp. 68-72) ; Methods and Materials of a New Technique for Using Pomace Flies in Biological Tests With Contact Insecticides, by H. T. Stultz (pp. 72-80) ; Some Fumigation Methods Employed in the United States to Prevent the Spread of the Japanese Beetle, by H. A. U. Monro (pp. 80-83) ; A Preliminary List of the Insects Collected in the Laurentide Provincial Park, Montmorency County, Quebec, by G. Chagnon (pp. 83-87) ; The Classification of Forest Insect Injury, by A. R. Gobeil (pp. 88-92) ; Some Possibilities in Control of the Pine Sawyer Beetle by Chemical Methods, by P. M. Morley (pp. 93-95) ; The Canadian Forest Insect Survey in 1939, by A. W. A. Brown (pp. 95-114) ; and A Summary Statement in Regard to Some of the More Important Insect Pests in Canada in 1939, by C. R. Twinn (pp. 115-125).

Among those presented at the meeting held at Guelph in November 1940 are the following: Spraying for the Control of the European Corn Borer in Sweet Corn, by G. M. Stirrett and R. W. Thompson (pp. 9-15) ; Hybrid Corn in the Corn Borer Control Program, With Notes on the Situation in Ontario in 1940, by R. W. Thompson (pp. 16-20) ; Feeding Habits and Vertical Movements of Third Year Grubs of *Phyllophaga ansia* Lec., by G. H. Hammond (pp. 20-22) ;

Field Experiments for the Control of the Mullein Leaf Bug *Campylomma verbasci* Meyer in Nova Scotia Apple Orchards, by A. D. Pickett, N. A. Patterson, J. M. Cameron, and M. E. Neary (pp. 23-25); Two Experiments Which Show Promising Control of the Columbine Borer (*Papaipema purpurifascia* G. and R.) (Phalaenidae), by W. G. Matthewman (pp. 26-29); Successful Hibernation of the Earwig Parasite *Digonicheta setipennis* Fall. in Ontario, by C. W. Smith (pp. 29-32); The Symphyliid *Scutigercella immaculata* (Newp.) as a Pest of Greenhouse Crops in Ontario, by G. G. Dustan (pp. 33-39); Biological Control of the Codling Moth in Ontario, by H. R. Boyce (pp. 40-44); The Introduction of Two European Parasites [*Ephialtes caudata* Ratz. and *Cryptus sexannulatus* Grav.] of the Codling Moth (*Carpocapsa pomonella* L.) Into Canada, by D. K. Naphtali (pp. 44-47); Preliminary Experiments on the Control of the Cranberry Fruit Worm in New Brunswick, by C. W. B. Maxwell (pp. 47-50); A Note on the Gross Estimate of Forest Insect Damage in Canada, by A. W. A. Brown (p. 52); and A Summary Statement Concerning Some of the More Important Insect Pests in Canada in 1940, by C. R. Twinn (pp. 53-61).

Insect investigations during 1940, A. W. MORRILL, JR., and D. S. LACROIX. (Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 444 (1941), pp. 278-285, figs. 3*).—A progress report (E. S. R., 84, p. 494) which mentions studies on dusts and sprays for simultaneous control of the potato flea beetle and tobacco thrips, control of the eastern field wireworm, and a field survey for various tobacco insects.

[Insect investigations by the Idaho Station]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul. 239 (1941), pp. 51-55*).—Progress (E. S. R., 84, p. 357) notes which mention a possible control for *Lygus* insects attacking alfalfa, by W. E. Shull and R. A. Fisher; European earwig bait improvement and cabbage maggot insecticide tests, both by Fisher; onion thrips control studies and turnip aphid and squash bug control, all by H. C. Manis; tomatoes grown free from beet leafhopper and the potato insect survey, both by Shull and E. L. Turner; insect blood studies, by Shull; pea weevil control, by Shull and T. A. Brindley; and crop rotations for wireworm control, by Shull and F. A. Shirk.

[Entomological investigations by the Kentucky Station] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 21-22, 29, 33, 46-47, 48-51*).—A progress report (E. S. R., 83, p. 518) which mentions results of studies on poultry lice, resistance of red clover to pea aphid injury, wireworm injury to tobacco plants, poison bait and methyl bromide fumigation for strawberry crown borer control, equipment for sterilizing greenhouse soil, control of green June beetle larvae, soil treatments for white grub control, white grub distribution, tomato fruitworm and codling moth control, ethylene dichloride for the peach tree borer, black vine weevil, and the white-fringed beetle.

[Investigations in economic zoology and entomology by the Massachusetts Station] (*Massachusetts Sta. Bul. 378 (1941), pp. 42-45, 59-71, 80*).—A progress report (E. S. R., 83, p. 796) which notes injurious and beneficial insects affecting the cranberry, including the hill fireworm *Tiascala finitella* (Walk.), cranberry weevil, cranberry aphid *Mysus scammelli* Mason, cranberry root grub *Amphicomma vulpina*, gypsy moth, grape anomala *Anomala errans*, black-headed fireworm (*Rhopobota* sp.), blunt-nosed leafhopper (*Ophiola* sp.), cranberry white grub (*Phyllophaga* sp.), cranberry fruitworm, and the rootworm *Colaspis brunnea costipennis*, cryolite as a cranberry insecticide, and tests with anhydrohexitol-coconut oil fatty acid esters for the control of the cranberry spittle insect, the black-headed fireworm, and the blunt-nosed leafhopper, all by H. J. Franklin; investigation of materials which promise value for insect control, the spray residue problem, parasites of the oriental fruit moth, control of onion

thrips, and potato spraying experiments, all by A. I. Bourne; control of the striped cucumber beetle, cabbage maggot, squash vine borer, biology and control of the apple leaf curling midge *Dasyneura mali* Kieff., control of the plum curculio in apples, and parasites of the European earwig, all by W. D. Whitcomb; apple maggot control and insecticides for the European corn borer, by Bourne and Whitcomb; naphthalene and similar compounds as greenhouse fumigants, by Whitcomb and W. Garland; control of the common red spider on greenhouse plants, by Whitcomb, Garland, and W. E. Tomlinson, Jr.; biology and control of the grape plume moth and grape cane girdler, by Whitcomb and Tomlinson; insects concerned in the dispersal of the Dutch elm disease and scouting for elm bark beetles, both by W. B. Becker; and red squill research, by A. S. Levine and J. A. Lubitz.

[Insect investigations of the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 29, 30).—A progress report (E. S. R., 84, p. 75) which notes webworm, cutworm, and armyworm injury and treatments used to control infestations.

Observations on insect pests in Samoa which are not yet known to occur in Hawaii, O. H. SWZLEY (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], 45 (1941), No. 1, pp. 25-38, figs. 18).—An entomological exploration trip to Samoa, May 27 to September 3, 1940, led to the securing of definite information on dangerous crop pests not at present known in Hawaii. The pests noted according to the crop or food plant which they particularly infest included 70 species, 12 of which were not previously recorded from Samoa.

A simple blowfly cage for the culture of surgical maggots, M. S. TARSHIS (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 10, pp. 1099-1101, figs. 3).

Insecticidal properties of the fatty acids, E. G. THOMSEN and M. H. DONER (*Soap and Sanit. Chem.*, 17 (1941), No. 4, pp. 94-98, 121).

Insecticidal dusts: A study of the effect on mortality of electrostatic charges produced by friction in applying insecticides, H. F. WILSON, C. E. DIETER, and H. L. BURDICK. (*Wis. Expt. Sta.*). (*Soap and Sanit. Chem.*, 17 (1941), No. 4, pp. 99, 101, 121).

A new fumigant, 1,1-dichloro-1-nitroethane, W. C. O'KANE and H. W. SMITH (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 438-439).—It is pointed out that the recent development of a new method of nitrating methane, ethane, and others of this series has made the nitroparaffins available in quantity. While these compounds are produced largely for various industrial uses, some of them are of such nature as to suggest possible employment in the chemical control of insects.

In the authors' studies of the derivatives, intensive experimentation with 1,1-dichloro-1-nitroethane has proceeded for 2 yr. with results that continue to enlist interest. In prolonged studies as to the effects of the gas on various articles, no detectable effect was noted on 20 kinds of furs nor on many samples of fabrics, including wool, cotton, linen, and rayon, which had been dyed by various processes; no effect on 70 samples of wallpapers nor on various samples of wood finishes; and no evidence of difficulty with copper, brass, bronze, tin, zinc, lead, nickel, cadmium, silver, or high-grade steel. Ordinary iron in an atmosphere of high humidity was corroded. Dry foodstuffs showed no injury nor did grains or cereals. Fresh fruits were definitely injured and so were plants in leaf. The ability of the gas to penetrate through obstacles was evident in many experiments. Thus, it readily passes through sealed packages of cereals and kills insects within. It penetrates sealed mailing tubes. There is no difficulty in penetrating through flour in sacks. Using larvae of the yellow mealworm and adults of the confused flour beetle, rice

weevil, and American roach, 100-percent kill of these insects, freely exposed to the gas in a tight fumigating vault at 26° C., was attained with the following dosage and time factors: 1.5 lb. per 1,000 cu. ft., 2 hr.; 1 lb., 3 hr.; 8 oz., 4 hr.; and 4 oz., 8 hr. When the same insects were buried in the middle of 100-lb. bags of wheat, placed in the fumigating vault, the dosage and time factors required for 100-percent kill at 26° were as follows: 3 lb. per 1,000 cu. ft., 4 hr.; 2.5 lb., 6 hr.; 2 lb., 8 hr.; 1.5 lb., 10 hr.; and 1 lb., 12 hr. The gas is apparently relatively safe to human beings. Clinical studies to date seem to indicate that it is no more toxic than the vapor of orthodichlorobenzene at equivalent concentrations, and the liquid can be similarly handled.

Fumigation of wet cotton with methyl bromide, H. A. U. MONRO and R. DELISLE (*Sci. Agr.*, 21 (1941), No. 9, pp. 584-587).—In the work reported, methyl bromide in a vacuum-dissipated treatment of 2 hr. at a dosage of 2.5 lb. per 1,000 cu. ft. at a temperature of 80° F. was completely toxic to adult granary weevils and European corn borer larvae placed in bales of wet cotton. After this treatment, the gas was rapidly removed by routine ventilation methods. This treatment involved no hazards to workmen or others in the proximity of the fumigated bales.

Harvest spray residue on apples from various spray treatments used at Lafayette and Bedford in 1939 and 1940, C. L. BURKHOLDER, O. W. FORD, D. L. JOHNSON, and E. D. SCHALL. (*Ind. Expt. Sta.*). (*Hoosier Hort.*, 23 (1941), No. 3, pp. 36-39).

Oil injury to woodlands, S. C. CHANDLER and W. P. FLINT. (*Ill. Expt. Sta. and Nat. Hist. Survey*). (*Arborist's News*, 6 (1941), No. 3, pp. 17-18).—The fruit tree leaf roller, an important apple insect though primarily a pest of shade and woodland trees, became abundant in Calhoun County and other sections of western Illinois in the spring of 1940, where it partially defoliated shade and woodland trees. The application of heavy oil sprays having caused severe injury to shade trees in some cases, especially hickory, walnut, and red and black oaks, an attempt was made to determine what would constitute a safe dormant spray for such trees. Plats of second-growth woodland trees averaging 20 ft. in height were sprayed on March 7, 8, 9, and 11 while dormant. On May 8, when they were in foliage, a check was made on the effect of the different oils on the various species of trees, the details of which are presented in table form. Many species escaped without injury. Dogwood, wild crab, hazel, and white oak were the least affected, but ash, elm, red and black oak, persimmon, wild plum, and redbud were seriously injured in a number of the plats, and hickory was badly injured or killed by nearly all the oils applied. In seven of the plats practically all hickories were killed, and in four others very severe injury occurred. The severely injured trees did not recover during the season, and most of them eventually died due to injury by bark beetles and other insects.

Insects and other animals attacking sugar cane in Cuba, L. C. SCARAMUZZA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 14 (1940), pp. 105-127, figs. 7).

[Contributions on fruit insects and rodents and their control] (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 131-171, 327-328, 436-465).—Among these contributions are Fruit Insect Studies of 1940, by S. C. Chandler and W. P. Flint (pp. 131-149) (*Ill. Nat. Hist. Survey*); The Pros and Cons of Nicotine Sprays in the Apple Schedule, by D. B. Perrine (pp. 159-164); Leafhopper Control by Spraying and Dusting, by O. G. Jones (pp. 164-165); The Most Practical Program for Leafroller Control (pp. 166-169) and New Method of Field Mouse Control (pp. 327-328), both by J. H. Allison; Fighting Fruit Insects in 1941, by S. C. Chandler and W. P. Flint (pp. 436-444) (*Ill. Nat. Hist. Survey*); and

Codling Moth Investigations at the Vincennes, Ind., Laboratory in 1939, by L. F. Steiner, S. A. Summerland, B. E. Hodgson, J. E. Fahey, and H. W. Rusk (pp. 444-465) (U. S. D. A.)

How to fight cabbage insects (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, p. 14).—A practical account.

New and unusual shade tree pests, E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 383-386).

Studies of elm insects associated with Dutch elm disease fungus, C. W. COLLINS. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 369-372).

Fauna of pine bark, H. RAMSEY (*Jour. Elisha Mitchell Sci. Soc.*, 57 (1941), No. 1, pp. 91-97).—An examination of 147 sq. ft. of bark of loblolly and shortleaf pine trees in the Duke Forest, N. C., made at all seasons, revealed the presence of 78 species of insects and 59 other species of animals. A classified list of the animals collected, representing a total of 1,479, is included.

Control of insect pests of grain in elevator storage, R. T. COTTON and G. B. WAGNER (*U. S. Dept. Agr., Farmers' Bul. 1880* (1941), pp. II+22, figs. 12).—This supersedes the portions of Farmers' Bulletin 1483 pertaining to insect pests of grain stored in country or terminal elevators and warehouses (E. S. R., 55, p. 253). It contains a practical account of stored grain pest control which includes information as to the use of hydrocyanic acid, chloropicrin, and mixtures of ethylene dichloride or carbon disulfide with carbon tetrachloride as stored grain fumigants.

[Contributions on plant resistance to insect attack] (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 335-367, figs. 4).—Contributions here presented relating to the resistance of plants to insect attack include The Place and Methods of Breeding for Insect Resistance in Cultivated Plants, by R. O. Snelling (pp. 335-340) (U. S. D. A., III. Expt. Sta., and III. Nat. Hist. Survey); Breeding Corn for Resistance to Insect Attack, by J. H. Bigger (pp. 341-347) (III. Nat. Hist. Survey); Breeding Wheat and Alfalfa for Resistance to Insect Attack, by C. M. Packard (pp. 347-352) (U. S. D. A.); Breeding Vegetables for Resistance to Insect Attack, by S. E. Bailey (pp. 352-358) (Univ. Calif.); and The Economic Value and Biologic Significance of Insect Resistance in Plants, by R. H. Painter (pp. 358-367) (Kans. State Col.). A copious list of references to the literature cited accompanies each of these contributions.

Two additional insect vectors of mosaic of abacá, or manila hemp plant, and transmission of its virus to corn, M. S. CELINO and G. O. OCFEMIA (*Philippine Agr.*, 30 (1941), No. 1, pp. 70-78, pl. 1).—It was found that in addition to the cotton aphid and *Rhopalosiphum nymphaeae* (Linné), the corn leaf aphid and a species of *Rhopalosiphum* (near *prunifoliae* Fitch) taken from grasses can transmit the mosaic disease of abacá. The periods of incubation of the disease with the corn leaf aphid as the carrier ranged from 8 to 15 days and with the *Rhopalosiphum* species from the grass from 7 to 15 days. The disease could not be transmitted by *Aphis laburni* Klth. and *Pentalonia nigronervosa* Coq. Successful transfer of the virus to corn was accomplished by the corn leaf aphid in 4 to 13 days. The inoculum was recovered from corn by corn aphids, and the virus thus recovered proved to be still infectious to abacá and corn seedlings.

Some notes on the relationship of plant viruses with vector and non-vector insects, K. M. SMITH (*Parasitology*, 33 (1941), No. 1, pp. 110-116, pls. 2).—In experiments here described "extracts of caterpillars and other insects are shown to inhibit the infective power of tobacco mosaic and tobacco necrosis viruses. The inhibitor is not sedimented after spinning for 2½ hr. at 30,000 r. p. m. Experiments with the nonvector insects such as caterpillars have

shown that the virus of sugar beet curly top, of tobacco ringspot, and other viruses are destroyed within the body of the insect. On the other hand, tobacco mosaic virus passes through the body of the caterpillar unchanged though greatly reduced in concentration. By the use of the specific insect vector and artificial feeding methods it was possible to recover the virus of curly top 24 hr. after it had been injected into the blood of the caterpillar, but the viruses of tobacco mosaic and tobacco necrosis could not be so recovered. Experimental evidence is given to show that the virus of beet curly top is present in the saliva of viruliferous insects."

The Philippine locust and its relation to Taiwan: A climatocological consideration [trans. title], K. KOMSUMI and K. OGASAHARA (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kuraishi)*, 12 (1940), No. 4, pp. 266-275, figs. 4; *Jap. text, Eng. abs.*, pp. 274-275).

Tube-building habits of the eastern subterranean termite, R. T. HOLWAY (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 389-394, figs. 4).

The influence of nutrition on egg-production and longevity in unmated female body-lice (*Pediculus humanus corporis*: Anoplura), A. J. HADDOW (*Parasitology*, 33 (1941), No. 1, pp. 40-46, fig. 1).

The sensory physiology of the human louse (*Pediculus humanus corporis* De Geer) (Anoplura), V. B. WIGGLESWORTH (*Parasitology*, 33 (1941), No. 1, pp. 67-109, figs. 35).

On the occurrence of the crab-louse (*Phthirus pubis*: Anoplura) in the hair of the head, P. A. BUXTON (*Parasitology*, 33 (1941), No. 1, pp. 117-118).

The slender lice of American pigeons and doves, with descriptions of two new species, F. H. WILSON (*Jour. Parasitol.*, 27 (1941), No. 3, pp. 259-264, figs. 10).—Two species of slender lice, *Esthiopterum (Columbicola) passerinae* from the eastern ground dove and *E. macrourae* from the eastern mourning dove, collected in Alabama and Louisiana, respectively, are described as new.

Ambush bug studies.—A summary, W. V. BALDUF. (Univ. Ill.). (*Ill. State Acad. Sci. Trans.*, 33 (1940), No. 2, pp. 206-208).—A report of studies of *Phymata pennsylvanica* at Urbana, Ill.

Notes on the family Mesoveliidae (Hemiptera), with descriptions of two new species, H. M. HARRIS and C. J. DRAKE (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 275-277).

A new genus and species of Anthocoridae (Hemiptera), [*Nidicola marginata*], H. M. HARRIS and C. J. DRAKE (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 343-344).

A method and contrivance for sampling pea aphid populations, K. W. GRAY and J. SCHVH. (Oreg. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 411-415, figs. 3).—A method of sampling pea aphid populations by means of which two or more persons could sample the same area and obtain equivalent results is described. It consisted of plucking the top 6 in. of the plants at random, shaking the aphids from the plant tips, and counting the aphids. A sampling can which consisted of a funnel covered with coarse screen mounted below a gas chamber was used to separate the aphids from plant parts. The plant tips and aphids were placed in the gas chamber containing fumes of methyl isobutyl ketone and left for 5 min. The fumes of the chemical caused the aphids to drop from the plant parts. The can containing the plant tips and aphids was given 50 shakes, thus causing the aphids to fall through the screen and be caught in a 4-oz. Sealrite carton at the bottom of the funnel. The aphids were counted in the laboratory later. One person without previous experience could take 40 samples by this method and count the aphids in about 8 hr.

Pea aphid control in Oregon, K. W. GRAY and J. SCHUH (*Oregon Sta. Bul.* 389 (1941), pp. 23, figs. 11).—Randomized field plats were used to test insecticides in broadcast peas from 1935 to 1940. Materials tested included dusts containing rotenone, pyrethrins, nicotine, sodium laural sulfate, methyl isobutyl ketone, dichloroethyl ether, and Cyanogas G. A dust containing 0.75 percent rotenone and 3 percent soybean oil proved most efficient for control, while about 35 lb. of dust per acre was the most efficient rate of application.

Influence of aphid resistance in peas upon aphid development, reproduction, and longevity, C. D. HARRINGTON. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 8, pp. 461-466, fig. 1).—Partially resistant Pride and the susceptible Perfection pea varieties were used under greenhouse conditions to determine the influence of aphid resistance in peas upon aphid development. Aphids were confined individually upon 30 plants of each variety. It was concluded, with reference to these varieties, that aphid resistance slightly reduces (3.1 percent) the rate of aphid development and that the resistance inhibits reproduction considerably (12.5 percent) and decreases aphid longevity (20 percent). It is thought that the cumulative effect of resistance on aphid populations during the pea-growing season might explain why resistant varieties are often able to produce a crop when susceptible strains are destroyed. Further, it appeared that data on relative rates of aphid reproduction appear to offer a better possibility for measuring the comparative resistance of pea varieties than data on rates of aphid development or length of life.

A bacterial pathogen of the citrus red scale, V. P. SOKOLOFF and L. J. KLOTZ. (Univ. Calif.). (*Science*, 94 (1941), No. 2428, pp. 40-41).—Record is made of the destruction of the adult females and crawlers of the California red scale on field lemons under laboratory conditions by a spore-forming, nitrate-reducing motile bacterium isolated from a certain soil in connection with denitrification studies. A similar, if not identical, micro-organism was later found in the dead red scale in some lemon orchards. Spraying with active cultures and immersion and dusting with the spores of the bacterium were studied as methods of bringing about a mass infection of the scale on lemons and on a number of other hosts. Mortality of the adult females was found to be in the vicinity of 100 percent under certain conditions. Immersion and dusting with the bacterial spores fruits previously sprayed with water appeared to offer more promise than spraying alone.

Sand-arsenical mixtures for controlling white grubs and their effect upon the growth of strawberries, T. W. KERR, JR. (Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 405-411, figs. 4).—In an investigation of sand-arsenical mixtures, used to control white grubs, *Phyllophaga* spp., and to determine their effect upon the growth of strawberries, it was found that lead arsenate and magnesium arsenate-sand mixtures retarded the growth of the four varieties employed, namely, Catskill, Premier, Dorsett, and Mastodon, during the early part of the season. Among plants of all four varieties treated with lead arsenate-sand mixtures, it was found in general that the more concentrated the sand-arsenical mixture the greater the reduction in growth during the early part of the season. Lead arsenate-sand 1-20 has been shown to be the most effective mixture. The addition of starter solution to the lead arsenate-sand 1-20 treatment benefited runner production in the four varieties investigated, but the results obtained indicate that runner production of plants treated with the mixture is not significantly different from untreated plants.

Cooperative Japanese beetle work in Maryland, G. S. LANGFORD, F. B. WHITTINGTON, R. H. VINCENT, and E. N. COBY. (Univ. Md.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 416-418).

The pale-striped flea beetle, T. L. BISSELL (*Georgia Sta. Cir.* 130 (1941), pp. 8, figs. 5).—A practical account which includes notes on plants attacked, description of the beetle, synonymy and related species, distribution, course of 1941 outbreak, and control of the pale-striped flea beetle.

Notes on the hibernation of the tobacco flea beetle and on the parasite *Microctonus epitricis* (Vier.), C. B. DOMINICK and G. WENE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 395–396).—In observations in Pittsylvania County, Va., more tobacco flea beetles were found in winter quarters in the soil around the base of tobacco stalks in old undisturbed tobacco fields than in vegetable covering above the soil surface. The percentages of beetles to survive the winter in cages were relatively low, although in one cage 30 percent of the beetles survived. Parasitism of the tobacco flea beetle by *M. epitricis* varied from 6.01 to 25.4 percent in different localities and at different times.

The tobacco flea beetle in abandoned plant beds, C. B. DOMINICK. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 397–400, fig. 1).—In an investigation conducted in connection with the work above noted and earlier (El. S. R., 82, p. 82; 83, p. 661), the importance of tobacco plant beds as breeding places for the tobacco flea beetle was under observation during the seasons of 1938 to 1940, inclusive. It was found that the immature stages of the insect were most abundant in soil samples taken from abandoned plant beds during the first half of June, although breeding continued until the investigations were discontinued in October. It was demonstrated that after the beetles emerge in abandoned plant beds and have fed for several days they migrate to nearby tobacco fields. Soil treatment with dichloroethyl ether and cultural treatment of the plant bed after transplanting has been completed gave satisfactory results as a control.

Longhorned and flatheaded borers attacking fire-killed coniferous timber in Michigan, F. T. PARMELEE. (Mich. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 377–380).—It is concluded that fire-killed coniferous timber in Michigan does not have any more attraction to wood-boring Coleoptera than timber killed by other agencies. The white-spotted sawyer was responsible for nearly all damage to dead coniferous timber observed in the State. While other species of wood-boring beetles contribute to the ultimate destruction of the wood, they are not present in large enough numbers to be considered of much importance. A study of the biology of the white-spotted sawyer indicated that under normal conditions in Michigan the developmental period is 1 yr.

Influence of the mountain pine beetle on the composition of mixed pole stands of ponderosa pine and white fir, C. B. EATON. (U. S. D. A.). (*Jour. Forestry*, 39 (1941), No. 8, pp. 710–713, figs. 4).

Dendroctonus piceaperda Hopk.: A detrimental or beneficial insect? A. R. GOBEIL (*Jour. Forestry*, 39 (1941), No. 7, pp. 632–640).—Data obtained in connection with an outbreak of the eastern spruce beetle that occurred in Gaspé Peninsula, Quebec, between 1931 and 1934 are used to illustrate how, from one viewpoint, this beetle appears to be a forest pest of major proportions, while, from another viewpoint, it may almost appear to be beneficial.

A beetle control problem in timbers of the old South Meeting House, D. M. MUIRHEAD (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 381–383, figs. 3).—Account is given of injury caused to the hand-hewn oak timbers of a historic building in Boston by the death watch beetle *Xestobium rufo-villosum* DeG. and the measures taken to combat it.

Experiments with an ambrosia beetle, *Xylosandrus germanus* (Blfd.), W. D. BUCHANAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 367–369).—This contribution is in continuation of that noted (El. S. R., 84, p. 357),

in which the author has shown *X. germanus* to transmit the Dutch elm disease fungus *Ceratostomella ulmi* to nursery elm trees under controlled conditions. In the work now reported this beetle was reared in the laboratory from debarked trunk sections taken from elm trees in the field. The beetles seldom entered wood on which the bark was left intact. When the outer bark or both the outer and inner bark were removed from small areas on the trunks of living trees in the field the beetles attacked these areas but did not oviposit in them. Thirteen elm trees were thus exposed to infestation by beetles that had been artificially contaminated with *C. ulmi*. All these trees developed external symptoms of the Dutch elm disease, and the fungus was isolated from the crown of each tree. The injection of ethyl alcohol into living trees was found to render them attractive to *X. germanus* beetles. Larvae that were removed from brood chambers in elm or red pine changed to adult beetles after they had been fed for over a month on one of the following fungi: *C. ulmi*, *C. plurianulata*, *Pestalozzia* sp., and one unidentified fungus.

Value of the petal-fall application of lead arsenate in controlling the plum curculio on peach in the South. O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 418-419).—In the experiments reported, it was shown that there were almost three times as many plum curculio adults on the trees that did not receive the petal-fall application of lead arsenate as on those that received this spray. These results confirm data previously obtained in support of the petal-fall application in the spray schedule for plum curculio control on peaches in the South. Plum curculio adults are found in greater numbers on peach trees nearest places of hibernation.

Notes on the morphology, life history, and economic importance of *Smicronyx utilis* Buchanan (Coleoptera: Curculionidae). J. G. REMPEL and W. SHEVKEK (Canad. Ent., 73 (1941), No. 6, pp. 100-104, figs. 13).—The small curculionid beetle here noted breeds in the seeds of the poverty weed (*Iva axillaris*), a native perennial found from the Saskatchewan-Manitoba border to British Columbia and south to Mexico and a most persistent and difficult weed to eradicate.

Radioactive tracer methods for determination of the disposition of arsenic in the silkworm. L. B. NORTON and R. HANSBERRY. (N. Y. State Expt. Sta. and Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 431-437, figs. 4).

***Coryphista meadii* (Packard), a new pest of Japanese barberry.** C. R. NEISWANDER. (Ohio Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 386-389, figs. 4).—This contribution relates to the geometrid moth *C. meadii*, which early in July 1940 was reported to have defoliated almost completely a number of hedges of four varieties of Japanese barberry at Wooster, Ohio. Notes are given on its life history and biological and insecticidal control. Lead arsenate in any of the formulas used was effective in controlling it.

The pistol case-bearer and its control in Pennsylvania orchards. H. M. STEINER and H. N. WORTLEY (*Pennsylvania Sta. Bul.* 406 (1941), pp. 26, figs. 10).—This insect is a native of North America, where it is primarily an apple pest. Partly grown larvae overwinter within a pistol-shaped case attached to twigs or fruit spurs. These larvae mature and pupate within the cases in late May and June, and the moths emerge in June or July. Eggs are deposited on the apple leaf surfaces within 2 to 5 days after moth emergence. The incubation period ranges from 11 to 20 days. After hatching, the larvae mine through the leaves and emerge on the lower surfaces into protecting cases that they construct of silk and bits of leaf tissue. They feed by making pinholes in the leaves and go into hibernation from late August to late October. Low maximum temperatures and thin or light green foliage during the oviposition period

are unfavorable for the development of pistol casebearer outbreaks. Predaceous and parasitic insects also destroy large numbers of larvae. Although thorough spraying with a complete schedule of lead arsenate will prevent the insect from attaining dangerous numbers, other measures are preferable to bringing an outbreak under control. Despite limitations, the efficacy of midsummer sprays of oil-nicotine or nicotine-petrol for this purpose was confirmed by these experiments. Two early applications of cube powder killed more than 95 percent of the larvae.

The life history and control of the pine tip moth *Rhyacionia frustrana* (Comstock) (family Tortricidae) at Nashville, Tennessee, M. F. MORTIMER (*Jour. Tenn. Acad. Sci.*, 16 (1941), No. 2, pp. 199-206, pls. 2, figs. 5).—The studies conducted indicate that fish oil emulsion will control this pest if applied during the egg or early larval stage. The most effective of the eight sprays tested, which gave 87.4 percent control in the first generation and 91.8 percent in the second generation, consisted of fish oil 2.25 pt., arsenate of lead 26 oz., laundry soap 3 lb., and water 50 gal. A second stronger emulsion gave even a higher control percentage (95.3) in the second generation, but burned the foliage so badly as to make its use inadvisable.

The seasonal life history consisted of three generations, the winter being passed in the pupal stage in the tunneled tip of the pine tree. Adults were seen from March 23 to April 4. Eggs were found from March 25 to April 25, larvae from April 25 to May 14, and pupae from May 14 to May 25. Adults from these pupae were seen from May 25 to June 8. Their eggs appeared from May 28 to June 12. Larvae from these eggs were found from June 12 to July 12. Their pupae were present from July 13 through July 24. Adults first appeared on July 23 and were last seen on August 3. Eggs from these adults were found from July 25 to August 4. Larvae first appeared on August 3, and the last ones pupated on August 19. These were the pupae that overwintered.

Finds sprays interfere with bud moth parasites, S. C. MENDALL (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, pp. 7, 10, fig. 1).—A brief account of observations on parasites of this pest with reference to the influence of sprays on their abundance.

Hibernating codling moth larvae, E. GOULD and G. H. GEISSLER (W. Va. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 445-450, figs. 3).—The results of studies conducted in an orchard near Martinsburg, W. Va., are reported, the details being given in five tables. The importance of the various locations of hibernating codling moth larvae was found to depend largely upon the ease with which the larvae can find satisfactory places to cocoon. The location and abundance of overwintering larvae is determined largely by the abundance of suitable cover. There is no apparent significance in the location of the recovered larvae. Apparently the larvae find hibernating quarters purely by chance and have no instinct for special locations or types of cover. No larvae were recovered from either the soil or the debris beneath any of the trees examined. Approximately 28 percent of the total worm population was collected on trunk and main scaffold limb bands, 3 percent remained in the harvested fruit, 39 percent was destroyed by predators and other natural factors, 15 percent escaped destruction and emerged, 12 percent was unaccounted for, and only 3 percent overwintered on the trees. More than 60 percent of all surviving larvae were caught in trunk and scaffold limb bands. Approximately 31 percent of the overwintering larvae were recovered from twigs and limbs less than 4 in. in circumference at point of larval location. Only 5.7 percent were recovered from the trunks and 7.4 percent from the main scaffold limbs. Almost half of the recovered larvae were concentrated in a few favorable

locations. An overwintering population of 41 larvae per tree gave a first-brood infestation of 36.4 percent the following season.

Studies of codling moth cocooning habits, A. M. WOODSIDE. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 420-424).—Observations conducted during the course of work at Staunton, Va., and extending over a period of 4 yr., are reported in seven tables.

" β -naphthol bands on mature, well-scraped apple trees captured 69 to 83 percent of the codling moth larvae that cocooned on those trees. The effectiveness of the bands was somewhat lower on unscraped trees, and untreated bands captured a smaller percentage of the larvae than treated. β -naphthol bands also captured more larvae than bands dipped in a mixture of oil and lampblack. When two treated bands, separated by a barrier, were placed on the same tree, the upper band captured about 60 percent of the larvae, the lower ones about 40 percent. On mature apple trees 70 to 85 percent of the larvae, exclusive of those in the bands cocooned on the branches, and more than half of the larvae were in locations where they could not be reached by scraping the trees. Distribution of the larvae on the trees was little changed by banding or scraping of the trees. Only 25 percent of the living larvae removed from treated bands in the fall of 1937 completed their development and emerged the following spring, and only 15 percent of those removed from treated bands in the fall of 1939 emerged the following spring. The emergence of larvae from untreated bands examined during the same years was, respectively, 62 and 50 percent. No codling moths emerged in cages placed over leaves raked up beneath heavily infested apple trees. Few moths emerged in cages placed over the soil beneath heavily infested trees."

Control of codling moth with arsenate of lead and certain forms of rotenone and pyrethrum, B. G. PRATT (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 424-426).—The value of D-X, a proprietary insecticide with a new base or carrier for rotenone and pyrethrum in which the rotenone and pyrethrins are apparently enclosed in an oil globule, is considered. Experiments with arsenate of lead and D-X combined that cover a 2-yr. period are said to indicate clearly the value of intensive first-brood measures and the possibility that, when conducted on a sufficiently large scale, second-brood infestation can be greatly reduced.

Evidence for a third brood of the grape berry moth (*Polychrosis viteana* Clemens) in the Great Lakes region, B. D. GLEISSNER and H. N. WOETHLEY. (Pa. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 426-431, figs. 4).—Investigations in Erie County, Pa., in 1939 and 1940 showed that in that area the grape berry moth produces a full first, a full second, and a partial third brood of larvae each season in vineyards growing on the lighter soil types such as gravels, gravelly loams, and sandy loams. The partial third brood is not produced, in some seasons at least, in vineyards on the heavier clay soils.

Learning to live with the European corn borer, L. L. HUBER (*Ohio Sta. Rimo. Bul.* 310 (1941), pp. 87-104, figs. 19).—Two methods of approach to corn borer control by individual effort are discussed. They are the use of hybrid corn and adjustment of planting date. According to the author, when adapted or less susceptible hybrids are used the adjustment in most cases will amount to no more than avoidance of abnormally early planting.

The European corn borer, E. N. CORY. (Md. Expt. Sta.). (*Md. State Hort. Soc. Proc.*, 43 (1941), pp. 40-42).

Studies on corn ear worm control, L. P. DITMAN, J. P. SECREST, and E. N. CORY (*Maryland Sta. Bul.* 439 (1941), pp. 205-223, figs. 2).—Desilking and the

application of mineral oil plus 3 percent dichloroethyl ether seem practical for corn earworm control on sweet corn grown for market. When infestations do not exceed 80 percent, desilking ears at weekly intervals after silks appear is a safe and fairly effective practice. Neither method adequately protects the corn from injury when earworm infestations approach 100 percent. Although the addition to mineral oil of 0.1 percent pyrethrin increased control efficiency, the increase did not justify the cost. According to the authors, poison bait shows promise as a simple and economical method of corn earworm control. Biological studies showed that dormancy in earworm pupae is caused by low temperatures, either low feeding temperatures (65° F.) or cold shock (40°) during the larval period. During severe winters dormant pupae survive in the soil, and in mild winters it is possible that nondormant pupae overwinter.

Observations on the egg and newly hatched larva of the corn ear worm on corn silk, G. W. BARBER. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 451-456, fig. 1).—The author presents descriptions of the egg of the corn earworm, of the method of hatching, and of the habits of the larva from the time it emerges from the egg until it begins to feed on silk at the tip of the ear. The average location of eggs on corn silk was 52.3 mm. beyond the tip of the husk. The eggs were found to vary in size and shape, the smallest observed being somewhat more than half the volume of the largest. The environment of the newly hatched larva on corn silk was found to be a veritable forest of silk and setae, through which it must find its way to the ear. The time between hatching of the larva and arrival at the tip of the ear could be divided into three periods, namely, feeding period, resting period, and migrating period. After completing emergence, and while clinging to a silken web that they spin for this purpose, most larvae devoured portions of the eggshell or a few setae in the vicinity. The average length of this period was 21.2 min. This activity was followed by a resting period, during which it is supposed the exoskeleton hardened. The average duration of this period was 29.6 min. The larvae then migrated to the ear tip where, protected by the encircling husks, they usually began to feed on the unwilted interior silks. The average duration of this phase was 29.6 min. The degree of tightness with which the interior silk strands were pressed together by the husk determined how far the larvae could force themselves within before beginning to feed. Since newly hatched larvae feed very little on exterior silks, it is unlikely that efficient control can be obtained by applications of insecticides to the exterior silks alone. Introducing the insecticides into the tip of the ear, where the larvae collect to begin feeding, shows promise, however, as a control measure.

The corn earworm and its control on sweet corn, B. B. PEPPER (*New Jersey Stat. Cir.* 413 (1941), pp. 13, figs. 8).—A practical account.

A progress report on tomato fruit worm studies, J. G. WATTS. (S. C. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 400-405, figs. 3).—In field experiments for the control of the tomato fruitworm commenced at the Edisto Substation in the spring of 1940, comparison was made of insecticidal dusts and baits, of insecticidal sprays, and of diluents. Because of the difference in price, more economical control was obtained with calcium arsenate than with other arsenicals or cryolite. Corn meal baits are considered particularly promising because of the relatively high degree of control which they produced, their low cost, and their ease of application. Data are presented on different dust diluents. Poisonous residue on the fruits was not a serious problem, as was shown by analyses of samples of tomatoes receiving the various treatments of both natural and synthetic cryolite with different diluents.

Glycogen in *Prodenia eridania*, with special reference to the ingestion of glucose, F. H. BABERS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 9, pp. 509-530, figs. 3).—The normal glycogen content of the southern army-worm was studied by analyzing entire insects at daily intervals during their life cycle. Glucose ingestion was then studied by feeding sixth instar larvae turnip leaf sandwiches containing glucose and determining blood glucose, blood glycogen, and tissue glycogen after varying intervals. Glycogen was found in the egg, but this disappeared at hatching. It reappeared in the larvae after feeding began and rose to a maximum at pupation. During the pupal period glycogen fell steadily but rose sharply again in the adult. Females (adult) contained more glycogen than males. The author concluded that this insect possesses an efficient glycogen-forming mechanism by which glucose is transformed into glycogen, and that the chief site of glycogen formation appears to be the fat body.

First instar characters for distinguishing the common inland species of anophelines of eastern United States, H. S. HURLBUR. (Cornell Univ.). (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 47-48, pl. 1).—A key is given for distinguishing the common malaria mosquito, *Anopheles crucians*, *A. punctipennis*, and *A. walkeri* in the first instar, and the taxonomic characters are illustrated.

Methods for controlling *Aedes aegypti* mosquitoes with *Gambusia holbrooki* minnows at Key West, Florida, J. H. LE VAN (*Pub. Health Rpts.* [U. S.], 56 (1941), No. 23, pp. 1217-1221, pls. 2).—The use of *G. holbrooki* minnows, obtained locally, was successful in the control of the yellow fever mosquito in their larval stage in drinking water cisterns and in wells and is considered a more enduring method of mosquito control for cisterns than oiling the water surface at intervals.

Hippelates (eye gnat) investigations in the Southeastern States, J. T. BIGHAM. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 439-444).—Observations and inquiries made on a survey trip through the Gulf States and Florida indicated that eye gnats are abundant in areas where a large proportion of the land is under cultivation and where the soil is of a sandy or muck type. These findings were later confirmed by the use of baited traps in many localities. The prevalence of sore eyes among school children is closely associated with the abundance of gnats. The use of field recovery cages revealed that practically all eye gnat breeding in the Southeast takes place in freshly cultivated soil. Most oviposition apparently takes place within a few hours after the soil is turned, and there is little or no oviposition after the first few days. During summer weather most of the adult gnats emerge within the third week after the plowing. Tests involving flooding of fields after plowing and leveling and packing soil after plowing indicated possibilities for control along these lines.

The toxicity of alkyl secondary amines to the housefly, P. A. DARR and C. W. KEARNS. (Univ. Ill.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 462-466, figs. 2).—Report is made of an investigation of the toxicity and rate of toxic action of 22 alkyl secondary amines to the housefly. The "large group" Peet-Grady method was used in making the tests. In the group of straight-chain alkyl secondary amines, the compound *N,n*-hexyl-*n*-heptylamine was found to be the most rapidly acting, as judged by the time required to produce approximately 95 percent knock-down. This compound likewise is more toxic than any lower members of the series and equal or superior to any of the higher members. Straight-chain alkyl secondary amines, having identical alkyl groups or differing by only one CH_2 group, are more toxic than isomers in which the two alkyl groups differ by a greater number than one CH_2 group. Branched-

chain alkyl groups substituted for a straight-chain alkyl group produce a reduction in toxicity and a decrease in the rate of toxic action.

Breeding places of the stablefly or "dog fly" (*Stomoxys calcitrans* (L.)) in northwestern Florida. S. W. SIMMONS and W. E. DOVE. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 457-462).—This report of preliminary observations of breeding places of the stablefly, conducted during the years 1939 and 1940, supplements the earlier observations of King and Lenert (E. S. R., 77, p. 821). The pest, which is of exceptional economic importance to coast-resort activities and the livestock industry in the northwestern part of Florida, where it is known as the dog fly, was found developing in different fermenting marine flora washed ashore on benches and in peanut litter left in the fields where peanuts were harvested. The observations suggest that these two breeding conditions represent, in general, distinct problems which occur in different locations at different times of the year, but which may prove to have a specific interrelationship.

Artificial multiplication of "*Lixophaga diatraeae*" in central "Cuba" for the control of the sugar cane moth borer "*Diatraea saccharalis*," S. CARRILLO and J. ALCEGO (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf.*, 14 (1940), pp. 129-134).

The introduction and colonization in Puerto Rico of beneficial insects parasitic on West Indian fruitflies, K. A. BARTLETT. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 1, pp. 25-31).

Control of Queensland fruit fly: Caged tree tests, S. L. ALLMAN (*Agr. Gaz. N. S. Wales*, 52 (1941), No. 5, pp. 281-282, fig. 1).—The studies reported indicate that foliage poison spray is more effective than traps baited with vanilla-ammonia lure as a means of protecting fruit against the Queensland fruitfly, and that tartar emetic is more effective in destroying the flies than sodium fluosilicate.

Notes on the autecology of some fruit-flies, V, [trans. title], K. KOIDSUMI and K. KUBOTA (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaisi)*, 12 (1940), No. 2, pp. 96-98).—This further contribution (E. S. R., 78, p. 828) deals with the effects of temperature and soil moisture on the adult emergence of *Chaetodacus ferrugineus dorsalis* Hendel.

Cross pollination of red clover by honeybees, J. M. ARMSTRONG and C. A. JAMIESON (*Amer. Bee Jour.*, 81 (1941), No. 5, pp. 214-216, figs. 2).

Behavior of honeybees toward brood infected with American foulbrood, A. W. WOODROW. (U. S. D. A.). (*Amer. Bee Jour.*, 81 (1941), No. 8, pp. 363-366, fig. 1).—A report of observations covering a 2-yr. period.

The host of another Illinois species of *Brachymeria* (Hymenoptera), B. D. BURKS. (Ill. Nat. Hist. Survey). (*Ill. State Acad. Sci. Trans.*, 33 (1940), No. 2, p. 208).—This further note (E. S. R., 78, p. 516) records *B. tegularis* (Cress.) as a hyperparasite of the tachinid (*Acemyia dentata* Coq.) parasite of the differential grasshopper.

On the search for hosts and the egg distribution of some chalcid parasites of the knapweed gall-fly, G. C. VABLEY (*Parasitology*, 33 (1941) No. 1, pp. 47-66, figs. 3).—Report is made of the egg distribution of five chalcid parasites of the knapweed gall fly (*Euribia jaceana* Hering, previously known as *Urophora solstitialis* L.) with a view to determining how certain parasitic Hymenoptera distribute their progeny among their hosts under natural conditions. A list is given of 27 references to the literature.

The biology and post-embryonic development of *Opius ilicis* n. sp., a parasite of the holly leaf-miner (*Phytomyza ilicis* Curt.), E. CAMERON (*Parasitology*, 33 (1941), No. 1, pp. 8-39, pl. 1, figs. 8).—A study of the biology

and postembryonic development of a braconid parasite reared from the holly leaf miner from Canada, described by G. E. J. Nixon² as new under the name *O. ilicis*, is reported. In the first stadium *O. ilicis* is a larval parasite, but the three succeeding instars live in the host pupa and the imago emerges from the puparium. It is pointed out that toward the end of the first stage of this parasite development of the larva is arrested, and further growth cannot take place until the host has pupated. The host relationship of the genus, because of its importance from both economic and taxonomic standpoints, is discussed at some length. A list is given of 17 references to the literature.

Life history studies of *Neodiprion americanum* (Leach), L. A. HETRICK. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 3, pp. 373-377, figs. 4).—Studies made of a sawfly (*N. americanum*) which came to the author's attention in the autumn of 1938, at which time it was found to have defoliated pine trees in scattered areas in eastern Virginia, and to have infested pine trees in King and Queen, Mathews, King William, and Caroline Counties are reported. The loblolly pine (*Pinus taeda*) is the favorite host tree, and the shortleaf pine (*P. echinata*) where it occurs with the loblolly pine is also infested. Some oviposition and larval feeding has been observed on Virginia scrub pine (*P. virginiana*), though usually it is not attacked by this sawfly. Adult sawflies were found to emerge in October and deposit eggs in the needles of the top branches of pine trees from 20 to 30 ft. tall. The eggs pass the winter in the needles, and hatching takes place late in April or early in May. Larval feeding is completed by early June, and the prepupae penetrate the soil to a depth of several inches, where they spin cocoons. Pupation takes place in September. Adult sawflies remain within their cocoons about 1 week prior to emergence in mid-October. Some prepupae carry over in their cocoons in the soil until the autumn of the following year. There is only one generation each year according to observations made up to the present. Due to the fact that the sawfly larvae eat only the old needles of the pines, the trees are not killed by repeated defoliation; however, wood production of defoliated trees is reduced. No outbreaks of bark beetles have been noted to follow defoliation by *N. americanum*.

The biology of the tropical cattle tick and other species of tick in Puerto Rico, with notes on the effects on ticks of arsenical dips, H. D. TATE. (Coop. U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 25 (1941), No. 1, pp. 1-24).—This pest (*Boophilus annulatus microplus* (Can.) (*australis* Fuller)), a variety of the common cattle tick, has a wide distribution. In the Western Hemisphere it occurs in South America, Central America, the West Indies, and Mexico. Although formerly occurring in several counties in Florida and over a smaller area in Texas, it has now been eradicated in the United States from all but the extreme southern portions of Texas and Florida. Biological studies on this tick were conducted under Puerto Rican conditions as a basis for eradication work. The preoviposition period was from 2 to 6 days, the oviposition period from 11 to 18 days, and the minimum incubation period from 18 to 70 days. In the dry southern coastal region and in the higher altitudes of the interior larval longevity ranged from 65 to 184 days and the total nonparasitic period, or time from the dropping of the engorged female to the death of the last larva, ranged from 89 to 251 days. Molting began from 7 to 12 days after the larvae attached to a bovine host, and nymphs completed engorgement from 12 to 26 days after attachment, or from 5 to 17 days after the larval molt. The time from the attachment of the larva to the dropping of the engorged female ranged from 18 to 37 days. Including both parasitic

² Ent. Mo. Mag., 3. ser., 25 (1939), No. 292, pp. 80-82, figs. 2.

and nonparasitic development, the life cycle on cattle in Puerto Rico ranged from 41 to 300 days. This tick was found on goats, sheep, and horses under natural conditions, indicating that these animals should be considered in an eradication campaign. Dogs, hogs, and other mammals are apparently of little importance as natural hosts of this tick in Puerto Rico. The tropical horse tick and the brown dog tick are economically important on the island. Standard arsenical dips were found effective for the control of the tropical cattle tick. Although these dips proved effective for tropical horse tick control, it was necessary to ascertain that the solution contacted all ticks on the infested animal. The hymenopteron *Hunterellus hookeri* was found to parasitize a high percentage of dog tick nymphs, but no parasites of the tropical cattle tick were noted.

The life-history of *Boophilus australis* (Fuller), S. N. SAPIRE (*Indian Jour. Vet. Sci. and Anim. Husb.*, 10 (1940), No. 4, pp. 346-353).—Report is made of the biology of this tick, as observed at Mukteswar, India, at an altitude of 7,500 ft. "The larvae of *B. australis*, when liberated on the body of the ox, seek a suitable place for attaching themselves. They take 3 days to feed and 4 days more for metamorphosis, so that the larval stage lasts for 7 days from the day of attachment to the host. The nymphs take 4 days to feed and 4 to 5 days for metamorphosis, and the nymphal stage therefore occupies a period of 7 to 9 days. The adult feeds for 10 to 11 days and then drops off for oviposition. The preoviposition period ranges from 2 to 7 days (average 4.4 days). The oviposition period ranges from 14 to 24 days (average 18 days). The female tick survives after oviposition for 2 to 8 days (average 4.4 days). The number of eggs laid by an individual tick varies from 200 to 4,725 (average 2,551.7). The egg stage at 22° C. lasts for 32 to 45 days, as reckoned from the commencement of the oviposition to the emergence of the first larva (average 38.57 days)."

Tick bites—*Dermacentor variabilis* (Say), L. H. WINTER and E. A. STRAKOSCH. (*Univ. Minn. et al.*). (*Jour. Invest. Dermatol.*, 4 (1941), No. 3, pp. 249-258, figs. 7).—The literature on the clinical manifestations of the castor bean tick is reviewed; the biology of ticks, the characteristics of the American dog tick, and its geographical distribution in the United States are discussed; and the clinical picture of bites due to this tick is described. A list is given of 17 references to the literature cited.

The ticks of East Africa.—I, Species, distribution, influence of climate, habits, and life-histories, E. A. LEWIS (*Indian Jour. Vet. Sci. and Anim. Husb.*, 10 (1940), No. 4, pp. 382-391).—A total of 74 species of ticks, representing 12 genera, are listed from East Africa, 18 of which species have been incriminated in the transmission of diseases.

Observations on the fertility of the black widow spider, G. WRIGHT (*Ill. State Acad. Sci. Trans.*, 33 (1940), No. 2, p. 225).

ANIMAL PRODUCTION

[Investigations on livestock production by the Idaho Station]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul.* 239 (1941), pp. 10-15, 22-25, 69-71, figs. 2).—Among studies made by W. M. Beeson, C. W. Hickman, D. W. Bolin, R. F. Johnson, E. F. Rinehart, D. E. Brady, J. K. Williams, C. E. Lampman, and J. L. Toevs, the following are reported: Phosphorus needed with beet byproduct rations for yearling steers and lambs; seasonal variation of blood phosphorus levels of range ewes; lower evaporation rate indicated on sharp-frozen meats; carotene requirements of laying hens and growing chicks; need for carotenoid

pigments in alfalfa by poultry lessened when adequate true vitamin A is supplied; beet sirup for production of spring lambs; comparative value of corn silage, beet top silage, and wet beet pulp for fattening calves and lambs; and alfalfa with and without grain for wintering stock calves

[Studies on animal production by the Kentucky Station] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 12-13, 13-14, 19, 21, 56, 57*).—Studies are reported on continuous v. rotational grazing of bluegrass pasture for ewes and lambs, creep-fed grain mixtures for suckling lambs, hay-feeding tests for pregnant ewes, alfalfa-molasses silage v. alfalfa hay for pregnant ewes and for steers in dry lot, pastures for hogs, the influence of rations on composition and quality of fat in eggs and chickens, measurements of the breast area in turkeys, comparison of 1-year-old hens with older hens for the breeding flock, and fertilizer treatment of pastures for steers.

Livestock experimental work in southwest Louisiana, M. G. SNELL and F. L. MORRISON (*Louisiana Sta., Rice Sta. Bien. Rpt. 1939-40, pp. 38-42*).—Brief results are presented on studies of the feeding value of rice, rice by-products, and molasses for beef cattle and sheep, concentrates for steers on pasture, and the effects of minerals in the ration of beef cows.

Growth and development, with special reference to domestic animals.—LII, Relation between organ weight and body weight in growing and mature animals, S. BRODY and H. H. KIBLER (*Missouri Sta. Res. Bul. 328 (1941), pp. 41, figs. 17*).—Further statistical study of growth (*E. S. R., 83, p. 672*) involved the relationship of weights of the more important visceral organs to live weight in mature and immature birds of several species. When the relative growth equation $Y=aX^b$ was fitted to the relation of live weight to organ weight, the weights of the neuroendocrine organs, such as the brain and the pituitary, controlling metabolism tended to increase with approximately the same fractional power as does basal metabolism, which substantiates the findings of G. Crile and D. P. Quiring.² During the early stages of growth, however, the value of b are higher for growing than for mature organs of different species. The organ weights may be predicted from body weights, and tables giving such data are presented.

Minerals for farm animals, J. R. HAAG (*Oregon Sta. Cir. 136 (1940), pp. 8*).—A summary of the needs of livestock for mineral supplements shows that the most economical production is obtained when mineral mixtures are limited to those supplying minerals likely to be deficient. Analyses of common feedstuffs for Ca and P are presented.

Relation of soil and plant deficiencies and of toxic constituents in soils to animal nutrition, L. A. MAYNARD. (Cornell Univ.). (In *Annual Review of Biochemistry, X*, edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev., Inc., 1941, vol. 10, pp. 449-470*).—A summarization of papers on this subject.

The carotene content of some South African feeds, II, S. J. MYBURGH (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 14 (1940), No. 1-2, pp. 421-430*).—Continuing this series,⁴ the author found in studies of the carotene content of six well-known grasses cut at monthly intervals that these grasses did not furnish adequate carotene to meet the needs of beef cattle during the dry winter months. On the other hand, carotene supplied during the growing stages was well above minimum requirements of livestock.

The loss of carotene in machine-dried alfalfa meal under variable conditions of storage, O. H. M. WILDER and R. M. BETHKE. (Ohio Expt. Sta.).

² Growth, 4 (1940), No. 3, pp. 291-298.

⁴ Onderstepoort Jour. Vet. Sci. and Anim. Indus., 5 (1935), No. 2, pp. 475-482.

(*Poultry Sci.*, 20 (1941), No. 4, pp. 304-312, figs. 3).—In further study of the relation of losses of carotene and vitamin A activity in alfalfa to storage temperature, as reported by Fraps and Kemmerer (E. S. R., 78, p. 834), the carotene content of alfalfa meal stored up to 1 yr. at temperatures ranging from -10° to 26° C. indicated that temperature was the big factor in carotene loss. The rate of loss was not affected by storage in burlap or paper bags or in pellet form. Carotene was maintained relatively stable by storage of the meal in vacuo in tin cans or under an atmosphere of N. Only 10 percent of the carotene was lost by storage for 6 mo. at from -23° to -26° , but at from 1° to 6° 50 percent was lost and at room temperature it decreased from 60 to 72 percent in potency. The loss at higher storage temperatures was so much more rapid that 98 percent disappeared in 16 days at 80° . There was an apparent increase in the carotene content of some samples of materials extracted with acetone-petroleum-ether, the reasons for which were not clear.

Formation of the anti egg-white-injury factor (biotin) in the rumen of the cow, L. W. McELROY and T. H. JUKES. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 296-297).—Supplementing a diet which produced egg white injury in chicks with 10 gm. of the dried rumen contents from cows on a vitamin B-deficient ration (E. S. R., 85, p. 384) prevented the occurrence of dermatitis at 24 and 26 days of age, suggesting that biotin was synthesized in the rumen of the cow.

Surplus wheat feeding experiments and demonstrations in Oregon.—A preliminary report, J. C. BUERNER (*Oregon Sta. Cir.* 137 (1940), pp. 40, figs. 8).—The results of experiments in feeding wheat to horses, cattle, sheep, and swine for wintering breeding stock and finishing slaughter animals at several stations in Oregon showed that wheat appeared to be a satisfactory substitute or replacement for every feed grain in every use to which it was applied in Oregon.

Peanut meal in livestock production, F. R. EDWARDS and Z. A. MASSEY (*Georgia Sta. Bul.* 216 (1941), pp. 20, figs. 14).—The relative costs of digestible protein and digestible nutrients in peanut meal and other oil meals were favorable to peanut meal. Results briefly presented from several experiment stations indicate that peanut meal is a promising source of protein for dairy cattle, beef cattle, sheep, swine, and poultry.

The phosphorus requirement for growing and fattening beef steers, W. M. BEESON, D. W. BOLIN, C. W. HICKMAN, and R. F. JOHNSON (*Idaho Sta. Bul.* 240 (1941), pp. 14, figs. 2).—The P requirement for fattening steers was met by rations containing 0.18 percent or more of P from sufficient bone meal, cottonseed meal, or meat meal as supplements to a basal ration of beet pulp, chopped alfalfa, and blood meal. The basal ration and one supplemented only with 0.3 percent of bone meal which furnished 1.23 and 1.45 gm. of P per day per 100 lb. live weight seemed to interfere with the utilization of feed, and the gains were reduced even before the appetite was decreased. About 30 percent more feed was required per unit of gain, and the steers were about 37 percent slower in manifesting aphosphorosis than calves with ample sources of this substance. Blood P when adequate was above 6 mg. per 100 cc. of plasma, but was less than 4 in deficient steers. No evidence of Ca deficiency was exhibited. The results were based on 3 years' experiments with six lots of eight 440-lb. calves each, fed for an average of 161 days.

Phosphorus needs for fattening steers, W. M. BEESON (*Idaho Sta. Cir.* 83 (1941), pp. 6, figs. 2).—A popular presentation based on the above.

Distribution of "trace elements" in the newborn calf as influenced by the nutrition of the dam, L. L. RUSOFF (*Florida Sta. Bul.* 359 (1941), p. 47).—In an analysis of 27 trace elements in the organs of the "salt sick" and normal

calves included in the previous investigation (E. S. R., 85, p. 652), no significant differences between the normal and salt sick calves were apparent. There were found zinc in practically all of the tissues and organs; aluminum and manganese in most of the tissues; barium, lead, molybdenum, and strontium in about one-half of the tissues; nickel and silver in about one-third; and boron, chromium, tin, titanium, cobalt, and vanadium occasionally. The following elements were not detected in any of the tissues: Arsenic, antimony, beryllium, bismuth, cadmium, cesium, lanthanum, lithium, thorium, tungsten, yttrium, and zirconium.

Alfalfa-molasses silage as a roughage for fattening steers, P. T. ZIEGLER, F. L. BENTLEY, and R. C. MILLER (*Pennsylvania Sta. Bul.* 410 (1941), pp. 11+13, figs. 5).—In three feeding experiments of 168 days' duration with 600-lb. steers, alfalfa-molasses silage fed with corn-and-cob meal produced average daily gains of 2.15 lb. per head, as contrasted with 2.18 lb. in groups of steers on corn silage. A third comparable group of steers receiving alfalfa only with the corn-and-cob meal made average daily gains of 2.06 lb. The steers on the corn silage carried slightly more finish, but those on the alfalfa-molasses were conceded to have tidier middles. The highest return per unit of corn-and-cob silage was superior to alfalfa hay but held no advantage over it as a sole roughage.

Soybeans versus soybean oil meal for fattening calves, P. GERLACH (*Ohio Sta. Bimo. Bul.* 210 (1941), pp. 127-129).—Whole soybeans did not prove as satisfactory a protein supplement to shelled corn, corn silage, and mixed hay when fed for 280 days to yearling steers as soybean meal. The rate of gain of 1.78 lb. per day was not as good as 1.96 lb. per head daily made on the soybean meal, although less concentrates were required with the whole soybeans. Further, the finish on soybeans was not equal to that on the soybean meal.

Levels of supplementary protein for pigs on pasture, T. B. KEITH, R. C. MILLER, and M. A. MCCARTY (*Pennsylvania Sta. Bul.* 407 (1941), pp. [2]+12, figs. 4).—In connection with studies of the protein requirement of pigs (E. S. R., 84, p. 508), tests conducted on alfalfa, rape, and red clover forage with concentrate mixtures of corn, tankage, soybean meal, and salt containing 9, 12, 15, and 18 percent of protein showed that the most economical gains were made on alfalfa and red clover pasture with rations containing 15 percent of protein. Eighteen percent seemed to be required between weaning and 130 lb. while grazing rape pasture. A 12-percent protein mixture was adequate for pigs on alfalfa and clover pasture after 70 lb. live weight was attained, but the gains were not economical. It appears that concentrate mixtures containing from 15 to 18 percent of protein are generally adequate for pigs on these pastures.

Calcium requirements of growing pigs, C. E. AYBEL, J. S. HUGHES, and W. J. PETERSON. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 62 (1941), No. 9, pp. 531-542, figs. 4).—Lots of 9-week-old pigs receiving rations of hominy, tapioca roots, blood meal, dried brewers' yeast, and minerals with from 0.1 to 1 percent of Ca in the form of monocalcium phosphate for 24 weeks made normal growth and bone development on 0.41 percent of Ca. Under the conditions of this experiment, when the level of P was 0.3 percent and adequate vitamin D was supplied, it seemed that a level of 0.25 percent of Ca was slightly below the minimum requirements, while 0.41 percent was definitely adequate for the normal development of pigs. Pathological conditions associated with Ca deficiency are summarized and described.

Feeding wheat or barley grain to pigs, L. J. COOK (*Jour. Dept. Agr. So. Austral.*, 44 (1941), No. 8, pp. 417-419, figs. 3).—Although the appraisals of the carcasses of three groups of Large White pigs fed crushed wheat and crushed malting barley and a mixture of the two grains with protein, minerals, and green feed were not significantly different and there were no significant differ-

ences in the feed required per unit of gain, malting barley produced slower gains than wheat. A limited number of crossbred pigs proved inferior to Large Whites.

Indiana stallion enrollment.—Report of stallion enrollment board for the year 1940, with lists of stallions and jacks enrolled (*Indiana Sta. Cir.* 263 (1940), pp. 48, figs. 4).—The usual report is presented for the calendar year 1940 (E. S. R., 83, p. 670), with discussions of the horse situation.

[Investigations on dog and poultry feeding and breeding by the Massachusetts Station]. (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul.* 378 (1941), pp. 79–80, 81, 100–103).—In addition to studies previously noted, brief reports are presented by J. Bernotavicz, C. R. Fellers, R. T. Parkhurst, K. G. Shea, F. A. Hays, R. Sanborn, M. S. Gutowska, F. L. Dickens, and W. T. Hastings of studies on the nutrient values of ingredients of dog foods; corn distillers' dried grains with solubles in the poultry ration; the rate of feathering and effectiveness of selective breeding to reduce mortality in Rhode Island Reds; the genetic laws covering the inheritance of high fecundity in domestic fowl; the requirement for Mn to prevent perosis in Rhode Island Reds; and factors affecting growth, pigmentation, and feathering in broilers.

Utilitarian breeds of domestic fowls. W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen*, 28 (1941), No. 4, pp. [4], fig. 1).—The merits of various breeds of poultry for egg, meat, and dual-purpose qualities are noted.

Surplus Leghorn cockerels as broilers. W. T. COONEY and F. E. PRICE (*Oregon Sta. Bul.* 386 (1940), pp. 23, figs. 7).—The results of 3 years' experiments in broiler production showed that the battery-reared broilers made more rapid and efficient gains than floor-reared birds having access to a sun porch. The body weight at 8 weeks of age of White Leghorns was approximately 1 week ahead of floor-reared birds. However, in batteries the incidence of breast blisters increased successively after the eighth week. A broiler mash with less oats and more wheat produced more rapid gains and birds of better average grade than did the starter mash. Broiler rearing in batteries was considered hazardous because of the difficulties in controlling ventilation, humidity, and temperature. Special directions are given for the production of a battery brooder in which these factors can be adequately controlled in battery rooms.

Effect of confinement in laying cages on the physical composition of hens. F. P. JEFFREY and R. E. BERT. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 302–303).—Single-Comb White Leghorn hens reared in cages from 20 to 74 weeks of age showed marked atrophy of the heart, liver, and gizzard. There were no significant differences in the weights of other organs of such birds kept on the floor or in cages.

The growth factors in cartilage for the chick. D. M. HEGSTED, S. W. HIER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 139 (1941), No. 2, pp. 863–869).—By methods followed in previous investigations (E. S. R., 83, p. 533), glycine and chondroitin fed together with arginine stimulated the rate of growth of chicks on rations containing 18 percent of casein and 5 percent of yeast, but the weight attained was somewhat less than that resulting from a supplement of 15 percent of cartilage. Cartilage and high levels of chondroitin showed considerable anti-gizzard-erosion activity.

The rôle of arginine and glycine in chick nutrition. D. M. HEGSTED, G. M. BRIGES, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. 191–200, figs. 5).—The requirement of the chick for arginine and glycine, noted above, showed that these amino acids function in connection with the formation of body tissue, creatine, and feathers. Comparative growth experiments with Plymouth Rocks and Leghorns and the occurrence of paralysis indicated that feather production was the principal factor in raising the requirement above that supplied by the same basal ration,

since the rapid-feathering breed (Leghorn) showed marked response to supplements of these products whereas the slow-feathering breed (Plymouth Rock) showed no response. Supplements of 1 percent of glycine plus 0.5 percent of arginine prevented paralysis and produced 3.72 and 3.99 percent, respectively, of creatine in the fresh muscle. Neither alone was effective. Cartilage supplements produced 4.29 and 4.67 percent, respectively, of creatine in the muscle.

Protein in poultry nutrition.—A review, G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 362-368).—A review of the literature on protein needs of poultry led to the conclusion that chick rations should contain approximately 18 to 20 percent, with reduction in the amount required as the chicks become older. To promote egg production, maintain body weight, and secure good hatchability and egg size, the laying hens should receive from 15 to 16 percent of protein. Part of the protein should come from animal sources.

Changes in pullet year albumen index as affected by age of bird, F. P. JEFFREY. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 298-301).—The albumen index determined by methods of Heiman and Carver (E. S. R., 76, p. 234) of eggs laid by pullets hatched at different seasons of the year proved to be a function of the age of the hen between 9 and 18 mo. Low egg production was associated with a high albumen index. This association was so complete that alteration in the season of hatching of the birds permitted the production of a firm albumen, even in the summer from fall-hatched birds, but it was impossible to obtain large eggs during the summer from such birds.

The intake and output of fat by the hen on low fat and normal ration, W. C. RUSSELL, M. W. TAYLOR, and H. A. WALKER. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 372-378).—The fat balances of hens on normal rations containing from 4 to 5 percent of fat varied from negative to positive, depending largely on their egg production. When a ration containing less than 0.1 percent of fat was fed, a negative balance resulted when any and, in some cases, when no eggs were produced. In other experiments with hens on low-fat rations, the quantity of fat in the eggs produced by one hen was approximately 21 times that consumed without loss in weight, thus suggesting fat synthesis from carbohydrate and protein. However, attention is called to the fact that the egg fat may have come from body fat. The fat in the eggs produced on the low-protein ration was definitely more saturated than the fat of eggs produced on more adequate rations.

Rations and methods of feeding layers, D. C. KENNARD and V. D. CHAMBERLIN (Ohio Sta. Bimo. Bul. 210 (1941), pp. 129-134).—The free-choice feeding of whole corn and whole oats with a 22-percent protein mash proved satisfactory for egg production in White Leghorns, but more favorable results with Rhode Island Reds were obtained when the entire ration was balanced. Dried skim milk did not prove a needed supplement. With both breeds, the whole oats-mash ration yielded the best returns in egg production and feed cost. This ration also tended to prevent feather picking.

Fodder yeast for laying pullets, H. TEMPERTON and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 26 (1941), No. 8, pp. 172-173).—Brewers' yeast and fodder yeast proved approximately equal to fish meal in a ration consisting largely of corn and wheat products for White Leghorn, Rhode Island Red, and Rhode Island Red × Light Sussex pullets.

The effect of different mash levels of alfalfa leaf meal in enhancing hatchability (Rhode Island Sta. Rpt. [1940], pp. 2-3, 62-63).—The efficiency

of egg production and hatchability of eggs was found to be increased by alfalfa leaf meal up to 10 percent of the mash.

Influence of various grits on battery-raised broilers, W. T. COONEY (Oregon Sta. Cir. 139 (1941), pp. 11).—Comparison of feed consumption, gains, and grades of finished broilers in two battery experiments of 8 weeks conducted with 140 and 250 White Leghorn cockerels fed limestone, granite, gypsum, or silica grits indicated, on the whole, that grit is a desirable addition to a normal ration, with siliceous giving slightly better results than Ca grits. Both limestone and silica grit produced broilers of better grade than were produced without grit or with gypsum grit.

Manganese absorption in fowl, M. S. GUTOWSKA, E. M. PARBOTT, and F. A. SLESINSKI. (Mass. Expt. Sta.). (Poultry Sci., 20 (1941), No. 4, pp. 379-384).—The amount of Mn absorbed in 2 hr. by a loop of the exposed intestine from anesthetized birds was proportional to the concentration and the weight of the bird. There was no significant difference in absorption by the cock and the hen.

Sorghum grains practical in poultry ration if vitamin A is supplied with ground alfalfa, H. S. WILGUS, JR. (Colo. Farm Bul. [Colorado Sta.], 3 (1941), No. 3, pp. 14-15).—A brief discussion.

The vitamin A, carotene, and xanthophyll content of the yolk of hens' eggs, B. SJOLLEMA and W. F. DONATH (Biochem. Jour., 34 (1940), No. 5, pp. 736-748).—From study of the yolks of eggs from 300 hens it was found that the vitamin A, carotene, and xanthophyll contents depended chiefly on the presence of these substances in the rations. For example, the ration determined whether an egg yolk contained 300, 150, or only 50-60 International Units of vitamin A. Yellow corn and green fodder were the most important sources of this vitamin and carotene. When yellow corn alone constituted 25 percent of the ration, there were 150 I. U. of vitamin A per yolk, but with 7.5 percent of alfalfa without yellow corn the yolks contained 270 μ g. of carotene. The yellow color of the yolk was due to xanthophyll, as well as carotene, but feeds containing xanthophyll were usually rich in carotene. On several poultry farms the vitamin A potency of the ration was not sufficient to produce eggs containing more than from 150 to 200 I. U., and it is unlikely that poultry will be given sufficient corn to produce eggs with over 300 I. U. of vitamin A. Shark oil was effective in increasing the vitamin A production in eggs of hens on low-A rations.

Some experiments on the physiology of vitamin A storage in the chick, M. RUBIN and H. R. BIRD. (Md. Expt. Sta.). (Poultry Sci., 20 (1941), No. 4, pp. 291-297, figs. 3).—In further experiments on vitamin A metabolism in the chick (E. S. R., 85, p. 113), it was found that vitamin A stores were built up in the liver as efficiently when carotene was fed as when vitamin A was included in the ration in amounts of 450 and 750 μ g. per 100 gm. of ration. Inoculation of day-old chicks with *Salmonella pullorum* had no significant influence during 12 days on the liver storage of the vitamin furnished to these lots. The yellow pigment stored in a chick's liver at hatching gradually decreased until from 3 to 4 weeks of age and then increased as the feed consumption of a good ration increased. Thus the first 5 weeks of a chick's life would appear to constitute a critical period in vitamin A metabolism.

The pantothenic acid requirement of chicks, and the amount in feed-stuffs as determined by microbiological assay, J. C. BAUERNEFELD (In Cornell University Abstracts of Theses, 1940. Ithaca, N. Y.: Cornell Univ. Press, 1941, pp. 223-226).—Single-Comb White Leghorn chicks on heated basal diets complete with supplements except in the amounts of pantothenic acid were found

to require from 500 to 540 $\mu\text{g.}$ of pantothenic acid per 100 gm. of feed consumed for the prevention of dermatosis and approximately 600 $\mu\text{g.}$ for maximum growth. Rhode Island Red chicks required about 75 $\mu\text{g.}$ per 100 gm. less than White Leghorns. These are considerably less than the requirements given by Jukes (E. S. R., 82, p. 93). The pantothenic acid content of feedstuffs ranged from 5.3 $\mu\text{g.}$ per gram for commercial casein to 37.5 $\mu\text{g.}$ for molasses. Samples of yeast were variable, ranging in pantothenic acid analysis from 29.3 to 150 $\mu\text{g.}$ per gram. Corn and barley showed the lowest pantothenic acid content of any of the cereals.

The effect of diet on the pantothenic acid content of chick tissues, E. E. SNELL, D. PENNINGTON and R. J. WILLIAMS (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 559-565).—Assays for pantothenic acid by the yeast method of R. J. Williams, E. D. McAlister, and R. R. Roehm⁵ and the bacterial method of Snell, Strong, and Peterson (E. S. R., 82, p. 162) confirmed each other and showed that tissues of chicks grown on diets deficient in this vitamin contained only 30-70 percent as much pantothenic acid per gram as those of chicks on normal rations. The growth was slower on a heated ration deficient in pantothenic acid, and it was evident that the total amount of vitamin in the entire tissues of such chicks was only 10-40 percent of normal because growth was retarded. See also a similar study with eggs (E. S. R., 85, p. 235).

Studies of variability of chicks used for the estimation of vitamin D.—I, Family differences in the ash content of the tibiae of day-old chicks, J. B. O'NEIL (*Poultry Sci.*, 20 (1941), No. 4, pp. 353-356).—Among the progeny of exhibition pens of Black Leghorns and White Leghorns there were significant differences in the body weight and percentage of ash of the tibiae according to dams, but because of differences in the vitamin D intake and the influence of environmental conditions not all of these differences could be considered genetic. Body weight and sex of chicks did not seem to be responsible for the variability in the ash content.

A factor in cod liver oil that hinders the utilization of vitamin E by chickens, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci.* 20 (1941), No. 4, pp. 369-371).—A factor in cod-liver oil seems to hinder the assimilation of vitamin E by chicks. In one experiment, nearly one-third of the chicks receiving 3 percent or more of cod-liver oil in their feed developed encephalomalacia and suppression of shank color. In 4 days, 19 of 20 such chicks recovered when 5 mg. of α -tocopherol were administered orally on alternate days, whereas 19 of 20 chicks continued without supplements were completely paralyzed and died in 8 days. The intramuscular administration of a single dose of 10 mg. of α -tocopherol produced recovery of muscular coordination in 6 days. Five of the chicks with lack of coordination did not recover when given α -tocopherol orally.

Vitamin K studies.—I, Effect of the vitamin K content of the hen's ration on the clotting ability of chick blood, W. W. CRAVENS, S. B. RANDLE, C. A. ELVEHJEM, and J. G. HALPIN. (Univ. Wis.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 313-316).—The blood clotting time of day-old chicks was inversely related to the vitamin K content of the ration consumed by the laying hens in two series of experiments. Rations made up largely of cereal feeds supplemented with meat scrap and milk fed to the laying hens produced chicks whose blood coagulating time was about 12 min. There was little benefit from the addition of 0.5 percent of alfalfa meal in one experiment, whereas the addition of 0.8 percent of alfalfa meal or 0.4 percent of dried cereal grass reduced the clotting time

⁵ Jour. Biol. Chem., 83 (1929), No. 2, pp. 315-320, figs. 3.

to from 6 to 7 min. From results with graded amounts of different sources of vitamin K in the second experiment, it was concluded that approximately 2 percent of alfalfa meal or dried cereal grass supplementing a green ration supplied adequate vitamin K to the laying hen to maintain normal clotting time and prothrombin values of the day-old chicks produced from the eggs laid.

Factors affecting egg quality, N. L. BENNION and F. E. PRICE (*Oregon Sta. Cir. 138 (1940), pp. 24, figs. 15*).—Following a general discussion of the effect of hereditary, management, and feeding practices on egg quality, plans are presented for maintaining a lower temperature and higher humidity in the egg storage room. About 95 percent of the eggs held in insulated storage at 66° F. with 83-percent humidity graded AA or A, whereas at a higher temperature and lower humidity nearly one-third of the eggs were of the B grade. Plans for the construction of a home-made cooler and humidifier are included.

Frequency of gathering eggs and effect upon interior egg quality, W. C. SKOGLUND and A. E. TOMHAVE. (Del. Expt. Sta.). (*Poultry Sci. 20 (1941), No. 4, pp. 322-326*).—Eggs left in the nest 4 and 8 hr. before candling in the summer months showed increases in the albumen score and decreases in the albumen height and amount of firm albumen. The deterioration in quality was greater for longer periods. In another experiment conducted in the winter months, eggs held for the same periods in a refrigerator at 40° F. showed no increase in albumen score and only slight decreases in albumen height and percentage of firm albumen. The deterioration appeared to result chiefly from temperature.

Rearing methods for young turkeys, G. C. CRANDALL (*New Jersey Stas. Hints to Poultrymen, 28 (1941), No. 5, pp. [4], fig. 1*).—Methods followed in rearing turkeys under total and semiconfinement conditions are noted.

Experiments on growing turkeys, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 210 (1941), pp. 134-136*).—Continuing the study of different methods of managing turkeys (E. S. R., 83, p. 237), the alfalfa and dried skim milk were omitted from the combination of feeds given to the range-fed group. There continued to be little difference in the rates of growth, but the loss from predatory animals, etc., was heavy in the range-fed lot.

Growth and calcification of Bronze turkey poults from hens fed different levels of Vitamin D, E. I. ROBERTSON, M. RHIAN, and L. A. WILHELM. (Wash. Expt. Sta.). (*Poultry Sci., 20 (1941), No. 4, pp. 357-361, fig. 1*).—At 4 weeks of age, poults receiving 200 A. O. A. C. chick units of vitamin D per 100 gm. of ration were about twice as large as poults which had received no vitamin D supplement. Growth and bone ash in young poults on a ration devoid of cod-liver oil were in proportion to the amount of vitamin D supplied to the dams. Symptoms of rickets appeared as early as 10 days of age in poults fed no cod-liver oil and from dams without cod-liver oil. The levels of this vitamin fed the hens were 100, 200, and 400 A. O. A. C. chick units per 100 gm. of the ration. The poults received two levels, one containing no vitamin D and the other 200 chick units per 100 gm. of the ration. At 3 weeks of age, the effect on bone ash of vitamin D in the dams' ration was overshadowed by the D in the poults' ration. Poults from hens which received sunshine as well as cod-liver oil attained greater weight than poults from hens which received the same or even higher levels of cod-liver oil.

The use of all-night lights for growing turkeys, T. T. MILBY and R. B. THOMPSON. (Okla. A. and M. Col.). (*Poultry Sci., 20 (1941), No. 4, pp. 332-336*).—A series of 4 years' experiments with more than 1,700 poults showed that all-night lighting did not increase the growth rate or feed consumption over normal poults receiving daylight. The period was divided into three stages—

brooding, growing, and finishing—of about 8, 20, and 28 weeks' duration, respectively. Lights may aid in preventing crowding and therefore feather picking.

A chick battery brooder designed for nutritional research, H. J. ALMQUIST and W. R. SMITH. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 337-338, figs. 3).—The structural details of a battery brooder having many advantages for nutritional research are described.

A comparison of five different Heiman-Carver yolk-color rotors, C. A. DENTON. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 329-331).—Study of five rotors for color determinations of egg yolks indicated that the Heiman-Carver yolk-color rotors (E. S. R., 75, p. 243) are not suitable for the accurate measurement of yolk color if such observations are made at different times or by different investigators. However, the method is of value for comparing measurements made at similar times and on similar machines and represents a step toward the development of a measuring standard for yolk color.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Idaho] (*Idaho Sta. Bul.* 239 (1941), pp. 16-18, 19-22, 49-51, 60-61, 71, fig. 1).—Progress reports (E. S. R., 84, p. 383) are presented on dairy herd improvement through the continuous use of proved sires, by D. L. Fourt and F. C. Fountaine; stud bull associations as a means of providing the services of good bulls to the small dairy herd, by I. H. Loughary; the value of nitrogen fertilizer in increasing the carrying capacity of irrigated pastures, by R. F. Johnson; a comparison of phosphatase tests, by Fountaine; a comparison of methods for determining the fat content of whey, and 5 years' improvement in the quality of milk delivered to creameries as a result of a quality-improvement program, both by H. C. Hansen; the difficulties encountered in applying the Babcock test to cream preserved with salt, and the effect of homogenization of cheese milk on the quality of Cheddar cheese, by Hansen and R. S. Snyder; improvement in the cream layer depth by standardizing milk with homogenized cream, by D. R. Theophilus; and vitamin A in milk from Ladino clover and other legumes and grasses, by E. Woods and D. R. Theophilus.

[Dairy investigations in north Louisiana], D. M. SEATH (*Louisiana Sta., North Louisiana Sta. Bien. Rpt.* 1939-40, pp. 30-32, 35).—Brief reports are presented on the history of this substation's dairy herd, including information on the contribution of good sires to herd improvement, and pasture returns from fertilization.

[Experiments with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul.* 378 (1941), pp. 20-22, 23, 50-54).—Brief progress reports (E. S. R., 83, p. 813) of dairy cattle nutrition investigations by J. G. Archibald, C. H. Parsons, and A. E. Conklin include the effect of complex mineral and vitamin mixtures on milk production, general health, and reproductive efficiency in dairy cattle; the influence of the Fe content of dairy rations on the Fe content of milk; phosphoric acid grass silage v. corn silage for milking cows and molasses grass v. corn silage for growing heifers; the value of urea as a partial substitute for protein in the ration of dairy cows; and the effect of feeding irradiated dry yeast on reproduction and general health in dairy cows.

From studies with dairy products by J. E. Fuller, R. W. Swanson, W. S. Mueller, J. W. Kuzmeski, A. F. Spelman, L. D. Lipman, M. J. Mack, L. R. Glazier, J. H. Frandsen, M. A. Widland, and H. G. Lindquist, results are noted on the cacao-red or tanninlike substances in commercial cocoa powders; the effect of various methods of pasteurization on chocolate milk; the bacterial

content of chocolate sirups and cocoa powders used in chocolate milk; the antioxidative properties of various sugars, cocoa shell, and puffed oat flour when added to milk and some of its products; the effect of various antioxidants on the behavior of gelatin or other stabilizers in ice cream; methods for determining the curd tension of milk; the use of corn sirup solids in ice cream and ices; factors affecting the appearance of melted ice cream; the efficiency and practicability of the paper milk bottle; and a comparison of the Electropure and vat methods of pasteurization.

Continuous vs. alternate grazing of bluegrass pasture for dairy heifers (*Kentucky Sta. Rpt. 1940, pt. 1, p. 12*).—A progress report.

[Results of pasture fertilization at Lafayette, La.], D. M. SEATH (*Louisiana Sta., Rice Sta. Bien. Rpt. 1939-40, pp. 34-35*).—Data for 1939-40 are presented supplementing an earlier report (*E. S. R., 81, p. 691*).

[Pasture improvement through fertilization in southeastern Louisiana], D. M. SEATH (*Louisiana Sta., Fruit and Truck Sta. Bien. Rpt. 1939-40, pp. 42-43*).—A progress report, the results being based on milk production.

Grass silage studies (*Rhode Island Sta. Rpt. [1940], pp. 18-19*).—This progress report indicates that winter rye, Sudan grass, Japanese millet, timothy, red clover, alfalfa, soybeans, and various mixtures all made satisfactory silage when harvested at the right stage of maturity. The condition of the crop when ensiled proved to be of more importance than the amount or kind of preservative.

The improvement of Indian cattle, A. K. YEGNA NARAYAN AIYER (*Cur. Sci. [India], 10 (1941), No. 4, pp. 185-190*).—A concise statement of measures being employed to improve the quality of cattle in India.

Physiology of dairy cattle, I (*Jour. Dairy Res. [London], 12 (1941), No. 1, pp. 78-107*).—Continuing this review series (*E. S. R., 81, p. 412*), part 1, Reproduction and Lactation, by J. A. B. Smith, includes 208 references to the literature.

Try timer on milking machines (*Farm Res. [New York State Sta.], 7 (1941), No. 3, pp. 13, 15*).—A brief summary of Bulletin 697 (*E. S. R., 85, p. 393*).

Experiments on the chemical enrichment of cows' milk by the administration of diethylstilboestrol and its dipropionate, S. J. FOLLEY, H. M. SCOTT WATSON, and A. C. BOTTOMLEY (*Jour. Dairy Res. [London], 12 (1941), No. 1, pp. 1-17, figs. 6*).—Various methods of administering diethylstilboestrol or its dipropionate to cows were employed in these trials. The oral administration of 1 gm. of diethylstilboestrol to a lactating cow had no marked effect on milk yield or composition. Five injections of 50 mg. of the dipropionate in oily solution at 48-hr. intervals caused only a slight increase in solids-not-fat content of the milk. Single massive injections of the dipropionate caused a rise in milk solids accompanied by a sharp decline in milk yield. The application of an ointment containing the dipropionate to the udder of cows led to a marked increase in milk solids with no change in milk yield. Similar results were secured by the subcutaneous implantation of crystalline diethylstilboestrol or subcutaneous injection of an aqueous suspension of this material in Short-horn cows. Similar injections in Ayrshire cows caused an increase in milk solids but were accompanied by an appreciable decline in milk yield. Thus it appeared that the threshold dose may depend upon the breed. In all cases, however, the threshold dose for inhibition was apparently higher than for enrichment. In favorable cases the enrichment represented a true increase in the yield of solids secreted and not merely a concentration due to reduced secretion of water. The administration of large doses of diethylstilboestrol to cows in advanced pregnancy resulted in abortion.

Some experiments with papaya in milk, J. H. NEWMARK (*Milk Dealer*, 30 (1941), No. 10, pp. 40, 42, fig. 1).—The addition of 1.5 oz. of papaya sirup or a like amount of strained papaya juice to a pint of fresh cow's milk resulted in the production of a very soft flocculent curd which later became dissolved through the digestive processes of the enzyme of papaya. Greatest efficiency was obtained when the milk was made slightly alkaline with bicarbonate of soda or lime water. The possible application of this process for improving the nutritive properties of milk is discussed.

Nomograph for correction of lactometer readings and calculation of milk solids, L. M. LAMPERT (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 9, pp. 527–528, fig. 1).—A simple nomograph based on the Quevenne lactometer reading is presented.

Methylene blue (reductase) test and plate count test, O. KUDELKA (*Queensland Agr. Jour.*, 55 (1941), No. 6, pp. 495–498).—A comparison of 2,804 parallel tests led to the conclusion that, in general, there is a good agreement in the two tests. When milk was classified for practical purposes as very good, fairly good, not satisfactory, and very unsatisfactory, the tests were in perfect agreement for the very good and very bad milks. In the middle groups, both tests had a common tendency, although it was not possible to coordinate exactly a certain reductase time to a certain plate count. It appeared that either test could be used satisfactorily for the practical grading of milk.

Lancefield Group B streptococci (*Streptococcus agalactiae*) on the hands of milkers and others, J. HARRISON (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 18–23).—In tests conducted at three separate farms, Lancefield Group B streptococci having the biochemical reactions of *S. agalactiae* were recovered from the hands of milkers. This occurred even in herds where mastitis infection was light and after the hands had been rinsed in a solution of hypochlorite containing 800 p. p. m. of chlorine. No organisms of this group were recovered from the hands of nonmilkers. It appeared that with inadequate hand disinfection the milker's hands are a potential source of danger to dairy cows.

Bacteriological aspects of farm milk cooling, T. G. ANDERSON (*Pennsylvania Sta. Bul.* 404 (1941), pp. [1] + 13, figs. 2).—Two series of farm milks, one cooled with well water above 50° F. and the other by electrical refrigeration, were included in this study. In the former series, milk held for 12 hr. showed a very marked increase in the bacterial content, indicating that such cooling did not afford adequate protection from bacterial growth. When electric refrigeration was employed so that the milk was cooled to around 40°, low bacterial counts were maintained during the 12-hr. holding period. Analysis of milk samples obtained from the top, middle, and bottom layers in the can indicated that in most cases 90 percent or more of the organisms in a 10-gal. can of milk cooled for 12 hr. are in the top or cream layer. Milk transported in cans protected only by a tarpaulin exhibited a temperature rise of from 12° to 21° during a period of about 2 hr. Air temperature and proximity of the cold cans to warm ones were primary factors determining the rate of temperature rise during transportation.

How quick freezing affects keeping quality of milk and cream, C. L. ROADHOUSE and J. L. HENDERSON. (*Calif. Expt. Sta.*). (*Food Indus.*, 12 (1940), No. 6, pp. 54–55, fig. 1).—Lots of certified raw milk, pasteurized market milk, pasteurized market cream, and pasteurized homogenized milk, cream, and evaporated milk sealed in cans under 25-in. vacuum were quick-frozen with constant agitation at –25° F. The frozen raw milk became oxidized after 3 weeks' storage at –5°. All other products were of reasonably satisfactory

quality after 6 weeks' storage, although the flavor generally was not quite equal to that of the fresh product. Bacterial counts were generally low after such storage. No change in the flavor of the products resulted from 2 days' storage at 40° after thawing. There was no apparent advantage in homogenizing either milk or cream when this quick-freezing method was applied.

Separation methods affect cream quality, K. C. BOXELL (*Indiana Sta. Bul.* 457 (1941), pp. 10).—The data presented were obtained from farms in a selected cream supply area and from the creamery which purchased the cream. Centrifugal separation and gravity methods of separation were used on 66.8 and 33.2 percent of the farms, respectively. When cream was graded on the basis of flavor at the creamery, the percentages of first-grade cream deliveries marketed by producers using the different methods of separation were centrifugal, 71.6; water-dilution, 41.1; and shallow pan, 40.2. As the amount of cream per delivery increased from 1 to 43 lb., the percentages of first-grade deliveries increased from 52.7 to 93.5 for centrifugally separated cream and from 21.5 to 70 for water-dilution separated cream. This trend was not observed in cream separated in shallow pans. Practically no seasonal difference was noted in the quality of cream separated by the centrifugal method, but the percentage of first-grade cream produced by gravity separation was considerably less in summer than in winter. The percentage of cream deliveries having class 1 sediment tests was 90.4, 37.8, and 80.7 under centrifugal, water-dilution, and shallow pan methods of separation, respectively.

Factors influencing mold mycelia in cream, P. R. ELLIKER. (Purdue Univ.). (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 7, pp. 8-9, 44-49).—A general discussion supplementing an earlier report (E. S. R., 85, p. 103).

Twenty-sixth annual report of the creamery license division, T. H. BRINEX (*Indiana Sta. Cir.* 260 (1940), pp. 16).—This is the usual report (E. S. R., 82, p. 676) of the number of creamery licenses issued and testers examined and licensed during the year ended March 31, 1940. The licensed dairy manufacturing plants in the State on October 1, 1940, are listed.

The experimental error in the plate count examination of butter, E. G. PONT (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 24-34, figs. 2).—In a study at the Department of Agriculture of New South Wales, 154 boxes of choice commercial butter were each sampled in three locations, and each sample was plated in triplicate in a dilution of 1:500. Application of χ^2 tests to this series showed that the means of the triplicate counts with plates of less than 300 colonies generally gave quite satisfactory estimates of the bacterial content of the samples. In two cases extreme within-sample variability was encountered, suggesting that the plate count was not always a reliable index of the sample population. A high between-sample variability was encountered as demonstrated by the large spread in the coefficients of variation for each box of butter. In another series consisting of 12 boxes of butter selected for quality and uniformity seven 1-oz. samples were obtained at random from each box. Highly significant differences were found to exist among the between-sample mean squares, extreme variability being encountered in 6 of the 12 boxes. It is concluded that the results of a single plating do not give an accurate estimate of the bacterial population of a butter sample and that when used as an index of the mean bacterial population of a complete box of butter it may be quite misleading.

Some factors affecting wheying off of cultured buttermilk, L. R. GLAZIER and H. G. LINDQUIST. (Mass. Expt. Sta.). (*Milk Plant Mo.*, 30 (1941), No. 5, pp. 27-30, figs. 3).—The influence of milk acidity, pasteurization temperature, and temperature of storage of the finished product was considered in these

experiments. The degree of curd separation and wheying off of the buttermilk was reduced as the acidity of the whole or skim milk increased. At an acidity of 0.68 percent the resulting buttermilk wheyed off freely, while at 0.87–0.93 acidity, the curd separated only after long periods of storage or when the storage temperature exceeded 88° F. Wheying off was increasingly inhibited with increasing fat content of the milk. Pasteurization temperatures below 180° were conducive to wheying off of the buttermilk, while a temperature of 200° proved more desirable than 180°. Relatively low storage temperatures are recommended, 33° giving better results than 38°, while temperatures as high as 50° were definitely undesirable.

Preliminary experiments on the vapour pressure of dairy products, G. W. SCOTT BLAIR, F. J. DIX, and A. WAGSTAFF (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 55–62, figs. 3).—The method used for estimating the vapor pressure of cheese consisted in enclosing weighed amounts of cheese in an airtight container with salt solutions of known vapor pressure and allowing them to distill at constant temperature for 48 hr. The cheese was then weighed and its vapor pressure calculated by interpolation for zero change in weight. The vapor pressure of cheese was much influenced by the amount of salt it contained, although differences between varieties could not be accounted for entirely on the basis of differences in salt content. A relationship between the vapor pressure of Stilton cheese and the amount of bluing which occurred was found to exist, although this phenomenon was not clearly understood. Application of the vapor pressure test for detecting the presence of added water in milk is described.

The consistency of cheese curd at the pitching point and its bearing on the firmness and quality of the finished cheese, G. W. SCOTT BLAIR and F. M. V. COPPEN (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 44–54, figs. 3).—This report deals with the extensive application of a previously described method for measuring the superficial density of cheese curd (*El. S. R.*, 84, p. 522). The results indicated that the consistency of curd at pitching is judged mainly from its elastic properties and that the test developed for measuring pitching consistency is closely related to the requirements of the practical cheese maker. A statistical analysis of the data failed to establish the relationship formerly believed to exist between firmness of curd at pitching time and acidity. A test is described for measuring the force required to thrust a skewer into a cured cheese. When applied to 40 mature cheeses this force was found to be highly correlated with cheese body as judged subjectively by one of the experimenters.

Starter cultures for cheese manufacture: Further attempts to eliminate failures due to bacteriophage, H. R. WHITEHEAD and G. J. EL HUNTER (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 63–70).—In a further report on this problem (*El. S. R.*, 81, p. 568), a case is described in which recurrent cheese starter failure occurred regardless of cheese starter culture used. By aspirating air from this plant through sterile water and then inoculating the water into fresh skim milk cultures of appropriate streptococci, it was demonstrated that an air-borne bacteriophage existed in the plant. Surveys of other plants indicated this condition to be widespread, with evidence that fine whey particles emitted from the whey separator were the main vehicle of the phage. In some cases the concentration of the air-borne phage was so great that under normal practice it was impossible to prevent infection of starter cultures for more than a few propagations. The use of a special culture room and other means of protecting the starter from air-borne phage eliminated the starter failures.

Purification and chemical nature of rennin, C. N. BHIMA RAO, M. V. LAKSHMINARAYAN RAO, M. S. RAMASWAMY, and V. SUBRAHMANYAN (*Cur. Sci. [India]*, 10 (1941), No. 4, pp. 215-219).—Steps are outlined for the concentration and preparation of the enzyme rennin in pure form. Preliminary findings indicate the absence of N, S, and P from its make-up and suggest that it is probably made up of only C, H, and O, and several mineral constituents, among which Zn is conspicuous.

"Slowness" in cheesemaking, J. HARRISON and D. V. DWARDEN (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 35-43).—Two cases of slowness in cheese making under farm conditions are described. In each case the final cheese produced was usually of good quality, even when the slowness was at its height. Repeated attempts to isolate either a bacteriophage or nonacid organisms from the cheese milk gave negative results. Abnormal or mastitis milk did not appear to be associated with the condition. Changing the source of the starter eliminated the trouble in each case. The inability of certain strains of starter organisms to grow at scalding temperatures is advanced as one of the causes of slowness in cheese making.

Some micro-organisms associated with gassy Swiss cheese, H. H. WISKER. (Ohio State Univ.). (*Natl. Butter and Cheese Jour.*, 32 (1941), No. 7, p. 20).—This brief note on the microflora associated with a gassy defect of Swiss cheese indicated that, in addition to the normal streptococci and lactobacilli types, lactose-fermenting yeasts were associated with the defect in considerable numbers. Also, anaerobic or facultative anaerobic bacteria, classified as members of the *Clostridium perfringens* group, were present in appreciable numbers, suggesting that they might play an important role in this cheese defect. Control measures are briefly discussed.

The organisms causing rusty spot in Cheddar cheese, C. S. PEDERSON and R. S. BREED (*New York State Sta. Tech. Bul.* 259 (1941), pp. 15).—In a further report (*E. S. R.*, 81, p. 102; 82, p. 248), new isolations of bacteria producing rusty spot in Cheddar cheese are described. These are chromogenic varieties of normally nonchromogenic organisms belonging to the species *Lactobacillus plantarum* Holland and *L. brevis* Bergey, et al. These species belong to the two main groups of species found in the genus *Lactobacillus*, the first producing only a trace of CO₂ in its production of lactic acid from glucose and other carbohydrates, whereas the second produces, in addition to lactic acid, CO₂, alcohol, and volatile acids from dextrose and mannitol from levulose. The need of further investigation to determine conditions under which these ordinary non-chromogenic types develop a rusty red chromogenesis is stressed. References are cited indicating that red varieties of streptococci and propionic acid bacteria may sometimes cause similar defects in cheeses.

Establishing a cheese factory in Texas: Fundamental considerations, M. W. KRIEGER (*Tex. Univ. Pub.* 4037 (1940), pp. 49, pls. 2, fig. 1).—Principal topics of discussion are manufacturing; promotion, including information on the factors influencing location of a plant, and its building, equipping, and operation; financing; and marketing.

The drying of cheese whey and of acid casein whey by the roller process, R. WATTE (*Jour. Dairy Res. [London]*, 12 (1941), No. 1, pp. 71-77, pls. 2).—Using a small-scale roller drier, experiments were conducted in drying (1) neutralized cheese whey, and (2) whey obtained in the manufacture of acid casein. The use of sodium or potassium compounds for neutralizing the whey caused excessive burning and other difficulties in drying and gave an unpalatable product of poor quality. Calcium hydroxide in the form of a suspension of finely ground slaked lime proved to be a satisfactory neutralizer which had

no adverse effect on the drying process or the quality of the dried product. Overneutralizing caused defects in the dried product. Calcium hydroxide also proved to be a satisfactory neutralizer for hydrochloric acid casein whey provided the acidity was not reduced below 0.18 percent. Complete neutralization resulted in the formation of a flocculent precipitate and deterioration in drying properties. Acetic acid casein whey could be dried without neutralization to give an excellent product.

Technical literature of ice cream for 1940, A. LEIGHTON (U. S. D. A.). (*Ice Cream Rev.*, 24 (1941), No. 10, pp. 36-37, 46-64).—A continuation of this comprehensive review and bibliography (E. S. R., 84, p. 243).

VETERINARY MEDICINE

American veterinary history, V-VII, B. W. BIERER ([Baltimore]: Author, vols. 5 [1940], pp. [5]+104-147; 6 [1941], pp. [4]+148-192; 7, pp. [4]+193-222+[10]).—A continuation of this work (E. S. R., 84, p. 100), presented with 355 references to the literature.

[Work in animal pathology by the Idaho Station] (*Idaho Sta. Bul.* 239 (1941), pp. 16, 19, 25-27, 45-46).—The work of the year (E. S. R., 84, p. 389) reported upon by G. C. Holm, W. M. Beeson, D. L. Fourt, F. C. Fountaine, W. V. Halverson, V. A. Cherrington, J. K. Williams, C. E. Lampman, D. W. Bolin, and E. Woods includes swine erysipelas, cause and control of bovine mastitis, short-wave diathermy plus sulfanilamide successfully controls acute mastitis, ketosis of dairy cattle, low mortality of station flock influenced by reduced virulence of fowl paralysis infection, orchard grass has perosis-preventive properties, pullorum disease, and discovery of paratyphoid in chinchillas.

[Work in animal pathology and parasitology by the Kentucky Station] (*Kentucky Sta. Rpt.* 1940, pt. 1, pp. 14-19, 19-20).—The work of the year (E. S. R., 83, p. 540) reported upon relates to parasites of horses, phenothiazine as an anthelmintic for horses, incoordination in young horses, virus abortion of mares, periodic ophthalmia, infectious enterohepatitis, acetoneemia and diabetes, paratyphoid bacilli, and effect of formaldehyde fumigation on chick embryo mortality.

[Work in animal pathology by the Massachusetts Station] (*Massachusetts Sta. Bul.* 378 (1941), pp. 103-107).—The work of the year (E. S. R., 83, p. 823) reported upon relates to pullorum disease eradication, diagnosis, flock mortality studies, avian pox in ruffed grouse, isolation of *Salmonella* types, viability of *S. pullorum*, transmission of pullorum disease by cohabitation, and avian encephalomyelitis, all by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke; and studies of neoplastic and neoplasticlike diseases, by C. Olsen, Jr.

[Work with animal diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 64-66).—The work of the year (E. S. R., 84, p. 101) reported upon relates again to infectious coryza, infectious bronchitis, and autopsy examinations of fowl and small animals.

The transmission of anaplasmosis by mosquitoes (Culicidae), D. E. HOWELL, G. W. STILES, and L. H. MOE. (Okla. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 107-109, 110).—In experimental work with three animals, two positive cases of mosquito transmission of anaplasmosis resulted. The first bovine was fed upon by *Psorophora columbiae*, *P. ciliata*, and *Aedes aegypti* (250 individuals) that had engorged on a cow that was convalescing from anaplasmosis. The second animal was fed upon by *P. ciliata* and *P. columbiae* (some 1,525 bites) that obtained their in-

fective blood from a clinical case. A third case was negative when the mosquitoes (*P. columbiae*, *P. signipennis*, *P. cyanoescens*, *P. ciliata*, and *P. discolor*), 494 in number, obtained their first feed from a carrier.

Brucellosis (undulant fever), W. M. SIMPSON (*U. S. Naval Med. Bul.*, 39 (1941), No. 3, pp. 339-367).—It is pointed out that the agglutination and skin tests are of considerable value in the diagnosis of acute brucellosis but are inadequate as diagnostic aids in the case of chronic brucellosis. The author has found that the opsonocytophagic test yielded a high proportion of inconsistent results. *Brucella* vaccine therapy has produced favorable results in from 60 to 85 percent of patients with either acute or chronic brucellosis. Sulfanilamide and other sulfonamide drugs are apparently of little benefit. Artificial fever therapy has yielded favorable results, particularly in those refractory patients who did not respond to vaccine therapy. A list of 131 references to the literature cited is included.

Brucellosis in horses and goats, W. S. STONE. (Cornell Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 118-120).—Of 419 goats tested for *Brucella* agglutinin content in New York State, where interest in the dairy goat has increased in recent years, many small dairies being distributed throughout the State and large quantities of goat's milk sold, 396 were completely negative in all dilutions, 20 had a titer up to and including a dilution of 1:50, and only 3 reacted at a higher titer. In no sample of milk were any *Brucella* organisms obtained nor were any *Brucella* agglutinins detected. Post-mortem examinations were made on 2 goats that reacted at titers of 1:25 and 1:50, respectively, and cultures and inoculations were made from the genital tract and some of the lymph nodes, but the supramammary, prefemoral, mediastinal, and retropharyngeal lymph nodes, as well as both ovaries and the uterus, failed to yield any *Brucella* organisms.

Fifteen stables of horses containing from 41 to 120 animals each were tested in New York City for brucellosis. The percentage in stables showing some reaction ranged from 69.69 to a low of 16.87. Of 1,169 animals tested in the city, 60.13 percent were negative at a dilution of 1:25 and only 9.49 percent were positive in a dilution of 1:50 or higher. Five horses reacted in a dilution of 1:200, and only 2 at 1:400, the highest noted. Horses that had been in New York City for from 1 to 5 yr. had fewer agglutinins in each case than did horses there for more than 5 yr.

Random blood samples were taken from horses on 97 farms in many different rural dairy sections of the State, and 270 serum samples were tested for *Brucella* agglutinins. Not quite half of the horses were negative in all dilutions, and very few high titers were obtained. Only 9 reacted in dilutions higher than 1:200, and the highest was complete agglutination at 1:12,800. On farms where brucellosis was known to exist among the cattle, the horses reacted at higher titers than did those on farms where the disease did not exist. No horse on farms which had cattle free from brucellosis reacted in a dilution higher than 1:25, but on the farms with *Brucella*-infected cattle, 7 horses reacted in dilutions of 1:100 or higher. Of the 36 horses on farms with infected cattle, 15 were negative in all dilutions, while on the clean farms, 85.7 percent were completely negative.

Blood samples were taken from all patients in the surgical clinic of the New York State Veterinary College as they entered, and rechecks made on the initial blood test as frequently as considered desirable. A total of 302 horses were tested, of which 112 suffered from either fistulous withers or poll evil. The remaining 190 horses were under treatment for other diseases. Of the 302 horses tested, 118 were completely negative, while 184 showed reactions at titers ranging from 1:25 to 1:51,200. Among the horses suffering from fistulous withers and poll

evil, 20 percent were negative in a dilution of 1:25, and 80 percent showed some reaction to the agglutination test for *Brucella*. In the group of clinical cases with other diseases, 50 percent were negative in a dilution of 1:25, and 50 percent were carrying some *Brucella* agglutinins.

B. abortus was isolated from 11 of 18 cases of poll evil and fistulous withers either by direct culture or by guinea pig inoculation. The organism was not recovered from any lesion that had been open more than 3 days. *Brucella* not infrequently invade the stifle and fetlock joints of horses. The lameness is severe and often swelling is produced.

Brucellosis in wildlife, J. S. KATZ. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 24-27).—This digest is presented with a list of 20 references to the literature.

Brucella abortus (strain 19) and calfhood vaccination, C. A. MITCHELL and T. MOORE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), Nos. 2, pp. 50-55; 3, pp. 79-83; 4, pp. 106-111).—The results of vaccination of calves in a small healthy herd with a view to determining the virulence of *B. abortus* (U. S. D. A. Bureau of Animal Industry strain No. 19) for calves and the vaccination of calves in infected herds are reported upon, the details being presented in 23 tables. The results are considered to justify the conclusion that "(1) *B. abortus* strain No. 19 does not bring about a progressive infection when inoculated into calves. (2) Irrespective of age or time of pregnancy, cattle exposed to vaccinated animals do not become infected with *B. abortus* strain 19. (3) Calves which become serologically positive following vaccination are resistant. Calves which fail to react are as susceptible as uninoculated controls. (4) Calves should be tested 30 days following vaccination, and those which fail to react revaccinated."

Is calfhood vaccination against brucellosis still in the experimental stage? C. M. HARING and J. TRAUM (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 22-23).—This contribution supplements that noted (*E. S. R.*, 85, p. 533).

Periodic ophthalmia and studies on the possible relationship to brucellosis, E. L. STUBBS, W. G. LOVE, and I. LIVE (*Jour. Amer. Vet. Assoc.*, 99 (1941), No. 773, pp. 142-144).—A description is given of a case of periodic ophthalmia in which there appeared to be 11 acute manifestations. The left eye suffered nine attacks, while the right one suffered seven attacks. Five times both eyes were involved simultaneously. The attacks lessened somewhat in severity, but the changes in each eye were progressive and resulted in blindness. *Brucella abortus* cultures were injected to investigate possible relationship to brucellosis, but none was found. Killed cultures produced agglutinins, but did not produce skin sensitivity. Living cultures produced skin sensitivity, but no evidence of sensitivity of the eye.

The recognition of psittacosis, H. VEEVOET and A. C. RUYTS (*Antonie Van Leeuwenhoek*, 6 (1939-40), No. 1, pp. 11-21).—In animal experiments with psittacosis virus, which is endemic among birds in Amsterdam, the virus is shown to be of low virulence, giving only occasional rise to human cases or small outbreaks. The results of animal experiments and complement-fixation tests with material from human cases and infected birds are recorded. A description is given of a reliable staining method for the virus, and the value of the complement-fixation test is noted.

The growth and effects of the tubercle bacillus on the chorio-allantoic membrane of the chick embryo: A method for studies in chemotherapy, E. W. EMMART and M. I. SMITH (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 25, pp. 1277-1286, pls. 4).—The growth of three human strains and one bovine strain of tubercle bacilli on the chorioallantoic membrane of the chick embryo was studied, and a description is given of their cytological effects. The incidence

of membranes with tubercles and the extent of tubercle development on the membranes following implantation of tubercle bacilli of strains of different degrees of virulence indicate that the method may be employed in evaluating their pathogenicity. No tubercles were produced on the chorioallantoic membrane by inoculations either with tuberculin or heat-killed tubercle bacilli. It is suggested that the method of implantation on the chorioallantoic membrane is applicable to the determination, within the short space of 6 days, of the tuberculocidal action of a drug or of its ability to attenuate the virulence of a given strain of tubercle bacilli.

Tuberculosis (human and avian) and leprosy (rat): Experimental production in the chorio-allantoic membrane of the developing chick.—A preliminary report, M. MOORE (*Jour. Bact.*, 41 (1941), No. 6, p. 786).

Observations on the vertical migrations of infective larvae of certain bursate nematodes, J. J. C. BUCKLEY (*Jour. Helminthol.*, 18 (1940), No. 4, pp. 173–182, figs. 12).—A description is given of the fundamental behavior of infective larvae of sheep and horse strongyles in the laboratory.

The physiological ageing of the infective larvae of *Haemonchus contortus*, W. P. ROGERS (*Jour. Helminthol.*, 18 (1940), No. 4, pp. 183–192, figs. 3).

Accessory growth factor requirements of some members of the *Pasteurella* group, S. BERKMAN, F. SAUNDERS, and S. A. KOSER (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 68–70).—In the preliminary work reported, 17 typical strains of several species of *Pasteurella* (*P. avicida*, *P. bovisseptica*, etc.), the laboratory cultures of which had been isolated originally from hemorrhagic septicemias in various species of animals, were employed in the study of their accessory growth factor requirements. The preliminary results here presented apply only to the typical strains of animal origin and not to other species at times included in this genus. It is shown that nicotinamide, pantothenic acid, and, in some cases, the butyl factor for clostridia are needed for prompt development.

Cysteine and related compounds for differentiating members of the genus *Salmonella*, W. R. HINSHAW (*Hilgardia [California Sta.]*, 13 (1941), No. 11, pp. 583–621).—In an earlier contribution, from which the present work grew, the author and Rettger (*E. S. R.*, 77, p. 402) reported preliminary results on the discovery that *S. gallinarum* produces a yellowish-white turbidity in a 12 percent gelatin medium containing 0.15 percent cysteine hydrochloride after 48 to 72 hours' incubation at 37° C., while *S. pullorum* causes no visible change in this medium even after prolonged incubation. In the present work, 80 out of 91 strains of *S. gallinarum* produced such a characteristic yellowish-white or grayish turbidity when incubated at 37° for 72 hr. in a gelatin medium containing 0.15 percent cysteine hydrochloride. After incubation at temperatures that do not liquefy the gelatin, a turbid halo appeared around the individual colonies in shake cultures and along the line of inoculation in stab cultures. None of 19 other species of *Salmonella* studied gave this typical reaction. *S. paratyphi*-A (2 strains) most nearly approached the *S. gallinarum* reaction, but it was not as clear-cut.

Of 12 species from other genera, only 2, *Pseudomonas aeruginosa* (4 strains) and *Proteus* from turkeys (5 strains), gave reactions resembling that produced by *S. gallinarum*. The optimum range of concentration of cysteine hydrochloride in gelatin for production of the *S. gallinarum* reaction is from 0.15 to 0.45 percent. No advantage could, however, be seen in using concentrations greater than 0.15 percent. The optimum range of concentration of gelatin as a vehicle for cysteine hydrochloride is from 10 to 15 percent. Concentrations above 15 percent inhibit the reaction slightly, and concentrations below 10

percent, though not affecting the typical reaction in *S. gallinarum* cultures, produce false reactions with some organisms. The optimum H-ion concentration for producing the *S. gallinarum* reaction is in the pH range of 7.2 to 7.6, with a decreasing efficiency as the pH is lowered beyond this. The characteristic reaction was noted only when *S. gallinarum* was grown in cysteine gelatin medium. Similar concentrations of cysteine hydrochloride in nutrient agar of various concentrations of agar, or in nutrient broth, were not characteristic enough to warrant their use. The *S. gallinarum* reaction as shown by *S. gallinarum* was produced when cystine was added to nutrient gelatin in quantities containing amounts of sulfur equivalent to that found in cysteine. Methionine and glutathione, however, were useless as supplementary compounds.

The Jordan-Harmon⁶ sodium potassium tartrate agar was a valuable supplementary medium to be used with cysteine gelatin differentiating *S. gallinarum* from *S. pullorum*. *S. gallinarum* (91 strains) consistently fermented this medium, with acid production, whereas *S. pullorum* (454 strains) produced no change in it. Several maltose-fermenting variants of *S. pullorum* have been observed in these studies. None of these has given a positive reaction either in the cysteine gelatin medium or in tartrate agar. Two strains, diagnosed as *S. gallinarum* by the donors because they are dulcitol- and tartrate-agar-positive, were studied. Both of these (G87 and G89) failed to produce a positive reaction in cysteine gelatin medium. Pacheco and Rodrigues⁷ *S. intermedius* B (4 strains) and Müller's⁸ *S. gallinarum* *duisburg* (4 strains) resemble *S. pullorum* in that they produce no change in cysteine gelatin nor in tartrate-agar medium.

These studies furnish additional evidence that *S. pullorum* and *S. gallinarum* are separate and distinct species.

A six-page list of references to the literature cited is included.

Salmonellas and micro-organisms apt to be confused with them: Observations on their incidence in the intestinal tract of normal foxes, J. L. BYRNE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 6, pp. 157-163).—Of 26 organisms isolated from 26 of 74 foxes examined, further tests revealed 5 late lactose-fermenting variants of *Escherichia coli*, 18 *Proteus* organisms, and 3 *Salmonellas*.

Biological products, L. GERSHENGOLD (*New York: Romaine Pierson Pubs.*, 1939, pp. IX+236+[8], [pls. 24, figs. 10]).—The manufacture, standardization, and use of biological products are dealt with in 30 chapters.

Studies on fat metabolism and susceptibility to carbon tetrachloride, J. C. FORBES, B. E. LEACH, and E. L. OUTHOUSE (*Jour. Pharmacol. and Expt. Ther.*, 72 (1941), No. 2, pp. 202-210).—The authors have found that the protective action of xanthine against liver damage from carbon tetrachloride is not directly related to the decrease in serum esterase which follows its subcutaneous administration to normal rats. "Animals with fatty livers starved for 24 hr. are very slightly, if at all, more susceptible to carbon tetrachloride than are normal rats starved for the same period of time. However, the oral administration of fat several hours before the time of poisoning increases markedly an animal's susceptibility irrespective of the concentration of liver fat. Xanthine administration does not affect the concentration of serum lipids of fasting rats or the blood lipid concentration following the oral administration of butterfat. Xanthine injections exert no demonstrable effect on the degree of ketonemia which results from starvation."

⁶ Jour. Infect. Diseases, 42 (1928), No. 3, pp. 238-241.

⁷ Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 9, pp. 905-907.

⁸ München. Med. Wchnschr., 80 (1933), No. 45, pp. 1771-1772.

Studies on phenothiazine, V, VII, VIII. (U. S. D. A. et al.). (*Jour. Pharmacol. and Expt. Ther.*, 64 (1938), No. 3, pp. 250-262, figs. 2; pp. 280-297, figs. 2; 65 (1939). No. 4, pp. 353-371, figs. 3).—In these further contributions (E. S. R., 85, p. 667), of which the sixth is noted below, the fate of phenothiazine in the body is reported upon by F. DeEds, C. W. Eddy, and J. O. Thomas in part 5, the bactericidal properties of urine after oral administration of phenothiazine by J. O. Thomas, F. DeEds, and C. W. Eddy in part 7, and the antiseptic value of phenothiazine in urinary tract infections by F. DeEds, A. B. Stockton, and J. O. Thomas in part 8.

Studies on phenothiazine, VI. J. O. THOMAS, J. B. McNAUGHT, and F. DEEDS. (U. S. D. A.). (*Jour. Indus. Hyg. and Toxicol.*, 20 (1938), No. 6, pp. 419-427, figs. 3).—This further report of studies (see above) deals with general toxicity and blood changes.

Studies on phenothiazine, IX. F. DEEDS and J. O. THOMAS. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 2, pp. 143-151).—Continuing these studies (see above), report is made of the biliary excretion and anthelmintic action of thionol.

Phenothiazine poisoning. C. D. FOLSE (*Vet. Med.*, 36 (1941), No. 8, pp. 430-431, fig. 1).—The findings here summarized indicate that the effective therapeutic dose of phenothiazine is not yet definitely established, and that much smaller doses than now recommended may be effective if combined with a suitable purgative. Certain factors yet unknown may influence toxicity, and the amount of sugar in the ration may be involved.

Sodium chlorate poisoning in cattle. G. R. MOORE. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 50-52).

Further investigations of rumen gases and bloat in ruminants. R. W. DOUGHERTY. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 110-114).—In continuation of earlier work (E. S. R., 82, p. 681), repeated determinations revealed the presence of carbon monoxide in rumen gas obtained from experimental cows in percentages ranging from 0.0 to 0.17 by volume. Hydrogen sulfide was found in rumen gas as much as 0.03 percent by volume and in rumen ingesta as much as 0.309 cc. per 100 cc. of ingesta. Feeding good alfalfa hay and freshly cut Ladino clover and alfalfa increased the H₂S content of the rumen ingesta. No correlation was found between carbon monoxide variations and feed changes. Small amounts of H₂S and CO were toxic when injected rapidly, followed by air insufflation, which caused an increase in intraruminal pressure. Both gases caused a distinct paralysis of the organ when sufficient concentrations were reached in the rumen. In both in vitro and in vivo studies, cystine, methionine, and inorganic sulfur all caused an increase in H₂S production. Comparatively large amounts of H₂S were found in gas and ingesta taken from a heifer that died of bloat.

Nonspecific hemoglobinuria and acute pulmonary emphysema of cattle as essential enterotoxemias. F. W. SCHOFIELD (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 28-32).—The author is led to the conclusion that from the present knowledge of this disease no definite statement can be made as to its toxic nature. He is inclined to the view that the disease is a manifestation of a primary enterotoxemia.

Orchitis and seminal vesiculitis associated with Trichomonas fetus and Corynebacterium pyogenes infection in a bull. A. G. KARLSON and W. L. BOYD. (Minn. Expt. Sta.). (*Cornell Vet.*, 31 (1941), No. 3, pp. 311-313, figs. 2).

Choriohemangioma of the bovine allantiois-chorion. A. G. KARLSON and M. D. KELLY. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 133-134, figs. 2).

Lymphoblastoma in dairy cattle, L. S. STARR and T. YOUNG. (Va. Expt. Sta.). (*Vet. Med.*, 36 (1941), No. 8, pp. 406-409, figs. 2).—The experimental work conducted related to (1) production of tumors following artificial irritation, (2) transmission by means of transplants of tumor tissue, and (3) genetic history. This affection is relatively common in some dairy herds and, since it is invariably fatal, results in a considerable economic loss. Of three cows that received intramuscular injections of a 4 percent suspension of tar and lard at weekly intervals over a period of 6 mo., one died of generalized lymphoblastoma approximately 3 yr. after the injections were started, while the other two remained healthy until sold for slaughter. Attempts to transmit the condition by direct implantation of fresh tumor masses in one male calf and by injection of tissue filtrate in another calf were unsuccessful. There was found to be some evidence of a possible genetic factor.

Newer developments in the therapy of shipping fever in cattle, H. W. JOHNSON and J. FARQUHARSON. (Colo. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 103-106).

Tuberculin reactions in cattle infected with *Mycobacterium paratuberculosis* (Johne's disease), H. W. JOHNSON, J. G. MILLIGAN, and B. F. COX. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 115-117, 118).—Of 347 cattle in three herds that were tested with both Johnin and tuberculin, 24 reacted to the Johnin test; none of the 313 Johnin-negative cattle reacted to the tuberculin test. Nine of the 24 Johnin reactors reacted to the tuberculin test also. No lesions of tuberculosis were found on autopsy in any of the 9 animals reacting to both tests; all 9 had lesions considered typical of Johne's disease, and acidfast organisms indistinguishable from *M. paratuberculosis* were found in stained smears from the intestinal mucosa of 8 animals of this group.

A preliminary note on the internal parasites of Puerto Rican cattle, with special reference to those species found in calves suffering from "tropical diarrhea," J. S. ANDREWS and J. F. MALDONADO (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 24 (1940), No. 4, pp. 121-132; *Span. abs.*, pp. 131-132).—A condition of Puerto Rican calves, locally known as tropical diarrhea, in which the affected animals develop anorexia, diarrhea, and anemia, become weak and emaciated, and many of them die, was investigated with a view to obtaining information as to the possible role of internal parasites. It is said that in some sections of the island this disease has made the raising of calves almost impossible, with the result that many dairymen have been forced to buy cattle locally or to import them in order to replace normal losses in their herds. A list of the parasites of calves collected during the survey was published in the report of the station for 1939 (*E. S. R.*, 83, p. 677).

The 4 most common species of gastrointestinal parasites in the 22 calves autopsied were *Bunostomum phlebotomum* (77.3 percent), *Oesophagostomum radiatum* (63.6 percent), *Cooperia punctata* (54.5 percent), and *Haemonchus contortus* (50 percent). Eight of the 22 calves and 1 calf not autopsied were found to be suffering from tropical diarrhea. These 9 calves were from 2 to 11 mo. old and were about evenly divided between the central mountainous section and the north and south coastal plains. Eight of the 9 cases occurred during the first 3 mo. of the calendar year, and one in June. *Eimeria zurni*, together with the 4 species of nematodes mentioned were recovered in large numbers from calves suffering from tropical diarrhea. The nematode *Strongyloides papillosus* was also implicated in 1 case by the presence of numbers of eggs in the feces of a calf. The remainder of the 21 species of parasites listed, with the exception of the lungworm *Dictyocaulus viviparus*,

which was found to be the cause of verminous pneumonia in 3 calves, were considered to be of little pathogenic importance in the calves examined. Three of the 9 cases of tropical diarrhea appeared to be due to a combination of malnutrition and heavy infestation with gastrointestinal parasites. One case was apparently caused by gastrointestinal parasites combined with bacterial infection (pneumonia), and 5 cases appeared to be due to infestation with gastrointestinal parasites alone.

Twelve species of parasites in addition to the 6 already mentioned have been reported by other workers as apparently responsible for cases of gastroenteritis in calves, namely, *Ostertagia ostertagi*, *Trichostrongylus axei*, *U. oncophora*, *U. pectinata*, *Nematodirus helvetianus*, *Ascaris vitulorum*, *Moniezia benedeni*, *M. expansa*, *Mecistocirrus digitatus*, and the young forms of *Cotylophoron cotylophorum*, *Paramphistomum cervi*, and *P. esplanatum*. *Cooperia oncophora*, *N. helvetianus*, *A. vitulorum*, *M. digitatus*, and the young forms of the 3 species of trematodes were not encountered in any of the calves autopsied. The remaining parasites were present in such small numbers that they were considered to be of little pathogenic importance.

It is concluded that, since tropical diarrhea does not differ from similar conditions occurring in calves in temperate zones which have been definitely associated with infestation with gastrointestinal parasites, and, since 4 of the 6 species of parasites found to be present in large numbers in calves suffering from this condition were the species found most commonly in all of the calves examined, the probable relationship of parasitic infestation to tropical diarrhea should be further investigated.

A list is given of 18 references to the literature cited.

The oöcysts of coccidia from domestic cattle in Alabama (U. S. A.), with descriptions of two new species, J. F. CHRISTENSEN. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 3, pp. 203-220, pls. 2, fig. 1).—In work conducted at the U. S. Regional Animal Disease Research Laboratory, Auburn, Ala., nine groups of coccidial oöcysts of the genus *Eimeria* were found in feces from healthy and scouring calves, seven fitting the descriptions of established species while two appeared undescribed. These oöcysts were differentiated largely on the basis of morphology and sporulation times under standardized conditions. The oöcysts redescribed as *E. zurnii*, *E. boris*, *E. canadensis*, *E. bukidiuonensis*, and *E. audurnensis* appeared to represent fairly well-defined groups. Morphological intergradation was noted between oöcysts answering the descriptions for *E. ellipsoidalis* and *E. cylindrica*, but other evidence is presented which indicates the probable specificity of these two forms. Further information, however, is needed to determine conclusively the validity of *E. cylindrica*, the more recently described of the two species. Two new species, *E. alabamensis* and *E. subspharica*, are described from oöcysts which appear to be sufficiently distinct from all other bovine coccidia to warrant specific identity. The names *E. boris* and *E. canadensis* are considered valid and are retained to define oöcysts later described as *E. smithi* and *E. zurnabadensis*, respectively, which are reduced to synonymy.

New sheep disease diagnosed by station, F. CROSS (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 3, p. 9).—The disease caused by *Listeria monocytogenes* was diagnosed for the first time in Colorado during the lamb-feeding season. In the outbreak in feeder lambs, the losses began 2 weeks after their arrival in the feed lots and continued for from 2 to 2.5 mo., with a few new cases appearing each day. Both lots of lambs originated in the same range area. The death loss was 5 and 6.5 percent, respectively, in the two separate feed lots, with almost all of the affected lambs dying. Although medicinal treatment was given, it proved of little or no value in overcoming the infection.

An attempt to determine the toxicity of *Amsinckia intermedia* (tarweed) for fattening lambs. O. H. MUTH. (Oreg. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 773, pp. 145-146).—The increased use of wheat for feeding livestock resulting from the surplus in the country during recent years led to an investigation of the toxicity of *A. intermedia*, a common contaminant of wheat grown in some parts of the Pacific Northwest, where it has been proved by McCulloch to be toxic to horses, swine, and cattle (E. S. R., 82, p. 679). In the present work with lambs wheat containing 25 percent *A. intermedia* seed was fed to two as a fattening ration for a period of 125 days. The lambs remained apparently normal throughout the feeding period, and no evidence of its pathogenicity was observed upon autopsy. Wheat screenings containing *A. intermedia* seed appear more suitable for the fattening of lambs than for other livestock feed. No off flavors were detected from parts of carcasses prepared for human food in the usual manner.

The epidemiology of low-plane nematode infection in sheep in Manawatu District, New Zealand. J. H. TERLEY (*Cornell Vet.*, 31 (1941), No. 3, pp. 243-265, fig. 1).—Presented with a list of 48 references to the literature.

Paratyphoid in a fawn. H. C. GAUGLE and S. GORDON, Jr. (N. C. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, p. 54).

The swine lungworm as a reservoir and intermediate host for swine influenza virus, I, II. R. E. SHOPE (*Jour. Expt. Med.*, 74 (1941), No. 1, pp. 41-47; 49-68, figs. 4).—This contribution is presented in two parts,

I. *The presence of swine influenza virus in healthy and susceptible pigs* (pp. 41-47).—Multiple intramuscular injections of *Hemophilus influenzae suis* were found to precipitate swine influenza virus infections in a group of apparently normal swine. The most likely explanation of the phenomenon seemed to be that the animals, though healthy and susceptible, harbored the virus in some unknown manner. The factors possibly determining the phenomenon were explored experimentally but without success.

II. *The transmission of swine influenza virus by the swine lungworm* (pp. 49-68).—The author finds that the swine lungworm (*Metastrongylus elongatus* and/or *Chocrostrongylus pudendotectus*) can serve as intermediate host in transmitting swine influenza virus to swine. The virus is present in a masked non-infective form in the lungworm, however, and, to induce infection, must be rendered active by the application of a provocative stimulus to the swine it infests. Multiple intramuscular injections of *H. influenzae suis* furnish a means of provoking infection. Swine influenza infections can be provoked in properly prepared swine during the autumn, winter, and spring, but not during the summer. The phenomenon, while not regularly reproducible, occurs in well over half the experiments conducted outside the refractory period of summer. No explanation for the failures is apparent. The virus can persist in its lungworm intermediate host for at least 2 yr.

Swine infected with swine influenza virus by way of the lungworm intermediate host exhibit a more pronounced pneumonia of the posterior lobes of the lung than do animals infected intranasally with virus. The situation of the worms providing the virus will account for this. Occasional swine infested with lungworms carrying influenza virus fail to become clinically ill after provocation but instead become immune. In these it is believed that lungworms containing the virus are localized outside the respiratory tract at the time of provocation. The experiments described are thought to furnish an explanation for the findings recorded in the preceding paper, in which swine influenza virus infections were induced in apparently normal swine by multiple injections of *H. influenzae suis*. In a single experiment swine lungworms failed to transmit hog cholera virus.

Observations on the viability of eggs of lungworms of swine, K. C. KATES. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 3, pp. 265-272).—Report is made of a series of tests, conducted at Beltsville, Md., aimed at determination of the survival time of eggs of swine lungworms (*Metastrongylus elongatus* and *Ocherostrongylus pudendotectus*) on and in soil and the effects of low and high temperatures and of drying on these eggs. "The viability of eggs in feces on the surface of unshaded outdoor plats was destroyed in about 25 days. Some eggs in feces buried 6, 8, and 12 in. survived 381 days, but most of these eggs succumbed in about 290 days. Under laboratory conditions the viability of eggs in moist feces was destroyed by short exposure to a temperature of 55° C. Eggs in moist feces survived 108 days at a temperature of -8° to -20°. Eggs in dried feces were destroyed in 25 days at a temperature of 17° to 22°. Eggs in dried feces at a temperature of 1° to 2° were still viable after 38 days."

Sleeping sickness or encephalomyelitis of horses (North Dakota Sta. Bimo. Bul., 3 (1941), No. 6, p. 28).—A brief note on this disease, again appearing in the State.

Equine encephalomyelitis, H. W. SCHOENING. (U. S. D. A.) (*Iowa Vet.*, 12 (1941), No. 4, pp. 5-7, 10-11, 31).

Influence of age on susceptibility and on immune response of mice to eastern equine encephalomyelitis virus, I. M. MORGAN (*Jour. Expt. Med.*, 74 (1941), No. 2, pp. 115-132, figs. 9).—Experiments conducted with the Rockefeller Institute strain of albino mice and the eastern strain of the virus of equine encephalomyelitis are reported. The observation was confirmed that with increasing age of mice there occurred a decrease in susceptibility to intraperitoneal injection of active virus, also the length of incubation period of those which succumbed increased with age. The mice of various age groups which survived an intraperitoneal injection of active virus were indistinguishable in their antibody response. Young mice vaccinated with formalin-inactivated virus when 2, 5, and 7 days old gave an immune response to such a degree that they showed (1) measurable peritoneal immunity which increased with small increments of age, (2) no cerebral resistance, and (3) detectable amounts of neutralizing antibody in their serums which paralleled, though at a considerably lower level, their peritoneal resistance. The peritoneal resistance induced as a result of vaccination was shown to be not local, but a general systemic immunity specific for the eastern strain. Such a peritoneal resistance was demonstrable by the fourth day after beginning of vaccination of 10-day-old mice. After intraperitoneal injection of active virus, large amounts of virus were recoverable from the blood of nonvaccinated young mice; none was found in the blood of vaccinated young mice; a minimal amount was detectable in the blood of nonvaccinated adult mice. The bearing of age on the degree of immune response of which mice are capable and on their susceptibility to the virus is discussed.

A list is given of 21 references to the literature.

Further examination of small mammals and birds in a search for carriers of equine encephalomyelitis virus, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 4, pp. 113-116).—In continuation of this work (E. S. R., 84, p. 250), report is made upon the results of examinations during May and June 1940 of 69 lots of brains, spleens, and ticks for the presence of equine encephalomyelitis virus. These lots consisted of 200 brains of ground squirrels, mice, and other small mammals and birds, 34 ground squirrel spleens, and 527 ticks (*Dermacentor andersoni*). One lot of ground squirrel spleens and one lot of mouse brains gave rise to thermal reactions in the inoculated guinea pigs, but no virus was demonstrated. All animals that survived were subjected to

a challenge inoculation of western virus and all succumbed. There was no evidence of the presence of the virus in any of the material examined.

The history and distribution of equine infectious anemia in the United States. C. D. STEIN. (U. S. D. A.). (*Vet. Med.*, 36 (1941), No. 8, pp. 410-414).—This contribution is presented with a list of 50 references to the literature.

Control of equine strongylosis.—III, The effect of pasture management on the development of strongylosis in foals, J. W. BRITTON, G. W. SALISBURY, and D. W. BAKER. (Cornell Univ.). (*Cornell Vet.*, 31 (1941), No. 3, pp. 289-294).—In continuing their studies (*El. S. R.*, 84, p. 397) the authors have found that under a system of rotational grazing of improved pastures the average egg count of the feces of the foals was 74 percent less in 1940 than that of the 1938 foals and 45 percent less than that of the 1939 foals. The rate of pick-up of infection was 74 percent less in the 1940 foals than in the 1938 foals and 57 percent less than in the 1939 foals. There was far better growth and condition of both the foals and the pastures in 1940 than in 1938 and 1939.

Controlling ticks on dogs. P. D. HARWOOD. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 43-45).—This discussion relates to the American dog tick and the brown dog tick.

The effect of arsenic, proteins, and thiamine on the toxicity of selenium to dogs. A. L. MOXON, H. D. ANDERSON, and M. RHIAN. (S. Dak. Expt. Sta.). (*Amer. Chem. Soc. Mtg.*, 101 (1941), *Abs. Papers*, p. 16-B).—In a study of the pathological changes associated with chronic selenium poisoning in dogs fed seleniferous cereals in their rations, extreme emaciation, anemia, cirrhosis and necrosis of the liver, development of collateral circulation, edema, and ascites were found the most prominent. Growing dogs fed a ration containing from 8 to 10 p. p. m. of selenium live only 3 or 4 mo., but if 5 p. p. m. of arsenic are added to their drinking water they develop none of the typical symptoms of selenium poisoning. One dog which received both selenium and arsenic was kept on experiment for nearly 2 yr. and showed no symptoms of selenium poisoning. The source of protein in the ration is of importance in the study of the toxicity of selenium to dogs. Tankage or casein offers little protection against selenium toxicity, while dried liver and linseed meal give considerable protection. The daily injection of small doses of thiamin into dogs receiving a seleniferous ration appeared to increase the toxicity of selenium. These dogs lived only a short time, and their livers showed more injury than livers from dogs which did not receive injections of thiamin but did receive the same amount of selenium in their ration. See also a note by Poley et al. (*El. S. R.*, 85, p. 113).

Clinical observations on the use of sulfapyridine in the treatment of canine distemper. A. H. BRYAN (*Vet. Med.*, 36 (1941), No. 7, pp. 365-367).—Clinical records of 20 cases in which sulfapyridine was employed in the treatment of canine distemper are reported. The drug appears to be a specific therapeutic agent in the treatment of the disease in its prodromal or early stages. "Every early case treated recovered within 4 days, and the symptoms abated within 2 days. (Previous to treatment with sulfapyridine, distemper usually ran a protracted course of 10 days to 3 weeks, and serious sequelae often ensued). Sulfapyridine therapy was even more effective when combined with homologous anticanine distemper serum, as shown by comparative findings. By administration of sulfapyridine, bacteriostatic effects were produced within 48 to 96 hr., after which time the dosage of the drug was gradually reduced, with complete recovery usually occurring at the end of the fourth to sixth day. Maximum doses do not appear to be necessary in canine practice. We gave 10 to 35 gr. (0.5 to 2 gm.) per day, depending upon the size and age of the dog, for a period of 2 to 3 days, with tapering doses from then on until recovery was complete.

Incomplete observations indicate that a better course may be to discontinue the administration of the drug altogether as soon as the temperature has fallen to normal, in order to avoid the loss of appetite which sometimes accompanies the use of sulfapyridine. Sulfapyridine is a specific for canine infections of the upper and lower respiratory tract, including pharyngitis, bronchitis, and lobar or broncho-pneumonia in the early inflammatory stages. Sulfapyridine is much less effective in the peracute and chronic stages of distemper. Old, protracted cases showed less response to the bacteriostatic effects of the drug, but beneficial results were noted in most instances. Sulfapyridine given in the early stages tends to prevent the complications and serious sequelae of distemper, such as hemorrhagic enteritis, dysentery, or chorea."

Methods and computation in fecal analysis, with reference to the red fox [*Vulpes regalis*], T. G. SCOTT. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 3, pp. 279-285).

Avian toxoplasmosis with invasion of the erythrocytes, R. D. MANWELL (*Jour. Parasitol.*, 27 (1941), No. 3, pp. 245-251, figs. 11).

Transmission of fowl spirochaetosis through agents other than *Argas persicus*, H. R. KAPUR (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 4, pp. 354-360).—In transmission experiments with *Ornithodoros papillipes* and *O. savignyi*, the ticks were infected with the fowl spirochete in their third nymphal stage and used on healthy fowls in their fourth and fifth nymphal stages. About 159 infective *O. papillipes* were fed on six healthy fowls and 88 *O. savignyi* on five healthy fowls, and the result was negative in each case, whereas two controls on which only 27 infective fowl ticks were fed showed a severe reaction after an incubation period of 6 days. In another series of experiments, mosquitoes belonging to the species *Aedes (Stegomyia) albopicta* were used. These were made to feed on fowls readily, but failed to transmit the disease. A third series of experiments carried out on three batches of fowls showed that the disease could be successfully transmitted to healthy fowls by smearing the infective material either on the unbroken skin of the comb or the breast. Incubation period in such cases was 2 to 6 days. Pyrexia was found to be an inconstant symptom in the experimentally induced disease.

The effect of *Eimeria tenella* (coccidia) upon the glycogen stores of the chicken, I. PRATT. (Univ. Idaho). (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 54-61).—In the studies reported, "the average liver glycogen of normal, uninfected chickens deprived of food for 19 hr. was 280 mg. percent; the muscle glycogen for these animals averaged 260 mg. percent; the blood sugar averaged 174.6 mg. percent. On the fifth day after chickens had been infected with oocysts of *E. tenella* the blood sugar averaged 291.5 mg. percent; the liver glycogen averaged 410 mg. percent and the muscle glycogen 220 mg. percent. The blood sugar of chickens during the sixth day after infection averaged 303.5 mg. percent, the liver glycogen 258 mg. percent, and the muscle glycogen 127 mg. percent. The effect of a seventh-day infection of coccidiosis was to produce an average blood sugar of 264 mg. percent, an average liver glycogen of 400 mg. percent, and a muscle glycogen of 250 mg. percent. A 62-hr. starvation produced an average blood sugar of 172.1 mg. percent, a liver glycogen of 52 mg. percent, and a muscle glycogen average of 299 mg. percent. Three hr. after artificial hemorrhage the average blood sugar was 247.3 mg. percent, the liver glycogen 121 mg. percent, and the muscle glycogen 235 mg. percent. The hypothesis is advanced that the source of the large amounts of blood sugar during the acute stages of cecal coccidiosis in the chicken may be the muscle glycogen stores."

The chemotherapeutic value of sulfathiazole in preventing and treating infectious coryza (*Hemophilus gallinarum* infection) in chickens, J. P. DELAFLANE and H. O. STUART. (R. I. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 772, pp. 41-42, 43).—Work with sulfathiazole was taken up after sulfanilamide and sulfapyridine had been administered to chickens in the experimental treatment of *H. gallinarum* infection and found to lack curative value. A limited number of experiments with sulfathiazole in concentrations of 1-, 0.5-, and 0.25-gm. quantities, respectively, per 30 gm. of mash proved effective in the prevention of clinical symptoms of coryza following inoculations of virulent cultures. The material also seemed of considerable value in hastening the recovery of infected birds. The studies indicate that it is effective only against laboratory infection during the time the drug is administered, and thus that the organisms are not all destroyed following inoculation but remain sufficiently retarded to prevent clinical symptoms. The blood from birds receiving sulfathiazole has a marked retarding effect on the growth of *H. gallinarum* in culture.

Studies of resistance to pullorum disease in chickens, H. M. DEVOLT, G. D. QUIGLEY, and T. C. BYERLY. (Univ. Md.). (*Poultry Sci.*, 20 (1941), No. 4, pp. 339-341).—The results of experiments conducted have shown that strains of relatively pullorum-resistant chickens may be developed by artificial selection or by natural selection in the presence of natural infection. Pullorum-clean flocks produced chicks which were relatively susceptible to pullorum induced by artificial exposure. Under the conditions of these experiments the pullorum resistance encountered was of a relatively low order. The existing data indicate that the development of pullorum-resistant strains is not now a satisfactory substitute for control and eradication programs by agglutination tests.

Fowl infection like pullorum disease, A. R. YOUNIE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 6, pp. 164-167).—Account is given of a few outbreaks of a pullorum-like disease that were encountered in flocks in Ontario during the hatching season of 1939. Their origin was difficult to determine, the eggs having been obtained from pullorum-negative flocks and the chicks reared in premises free from contamination.

Microanatomy of the duodenum of the turkey, L. E. ROSENBERG (*Hügaridin [California Sta.]*, 13 (1941), No. 11, pp. 623-654, pls. 8, figs. 8).—This contribution on the normal histology of the duodenum of the turkey deals mainly with tissues of the adult but contains a brief section on the conditions obtaining in younger birds. It is presented with a list of 36 references to the literature cited.

Encephalitis-like symptoms in turkeys associated with a *Pasteurella* sp., R. FENSTERMACHER and B. S. POMEROY. (Minn. Expt. Sta.). (*Cornell Vet.*, 31 (1941), No. 3, pp. 295-301).—The finding of an atypical *Pasteurella* organism with a predilection for brain tissue of turkeys is reported upon.

Plasmodium durae, a new species of malaria parasite from the common turkey, C. M. HERMAN (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 22-26, pl. 1).—A species of malaria parasite which was found to parasitize the red blood cells of 1 of 75 domestic turkeys examined in Kenya Colony, British East Africa, is described as new under the name *P. durae*. It was found extremely pathogenic and fatal to young turkeys.

Sarcosporidiosis in a black duck, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc.* 99 (1941), No. 772, pp. 52-53).

Exoerythrocytic schizogony associated with the maternal strain of *Plasmodium* relictum after passage through ducks, M. DOBLER (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 49-53, figs. 2).

Modifications of Plasmodium cathemerium when transferred from canaries into ducks, R. HEGNER and E. WEST (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 27-39, figs. 5).

Transmission of malaria parasites (Plasmodium cathemerium) from canaries and ducks to fowls and their modification, R. HEGNER and E. WEST (*Amer. Jour. Hyg.*, 34 (1941), No. 1, Sect. C, pp. 40-46, figs. 2).

The oral transmission of Plasmodium relictum in the pigeon, M. D. YOUNG (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 28, pp. 1439-1440).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Idaho Station]. (Partly coop. U. S. D. A.). (*Idaho Sta. Bul.* 239 (1941), pp. 38-40).—Land reclamation and conservation research is reported upon by H. Beresford, J. P. Bonner, M. R. Kulp, J. C. Marr, J. L. Toevs, and W. Watson; field power and machinery by Beresford, T. A. Brindley, L. M. Christensen, E. N. Humphrey, and G. W. Woodbury; the rapid developments in rural electrification by Beresford; and preparation of farm-building plans by Beresford and K. H. Parks.

[Agricultural engineering investigations by the Massachusetts Station] (*Massachusetts Sta. Bul.* 378 (1941), pp. 58-59).—This reports upon a cranberry-storage investigation, by C. I. Gunness, H. J. Franklin, and C. R. Fellers; an apple-storage investigation, and frost protection on cranberry bogs, both by Gunness; and an investigation of electric brooders in colony houses, by Gunness and W. C. Sanctuary.

Factors affecting the decreasing rate of flow of liquids through wood, B. E. ANDERSON, R. A. GORTNER, and H. SCHMITZ (*Minnesota Sta. Tech. Bul.* 146 (1941) pp. [1]+70, figs. 10).—This subject is here dealt with in two parts, the first taking up electrokinetics and wood penetration, while the second discusses further studies on the mechanism involved.

A pivoting action whereby the fibrous units assume positions which offer greater resistance to flow is suggested as the cause of the decreasing rate of flow through cellulosic filter materials and as a mechanism also active in producing the falling off in rate of flow through woods. The disproportionate increase in rate of flow when pressure is increased has been attributed to a lateral movement of the fibrous units, brought about by differences in the static pressures of the liquid on opposite sides, whereby the larger capillaries are increased at the expense of the smaller ones. The supposition of a bulging of the pit membrane cannot adequately account for the pressure-rate relation. Electrokinetic changes, swelling, plugging by particles, blocking by air, and pit aspiration have also been eliminated from consideration as important factors in producing decreasing rate of flow. Electrokinetic properties are, however, factors comparable with viscosity in importance in determining rate of flow in very small capillaries. The radii of the pores of softwoods are below the critical radius above which the common streaming potential equation holds. The zeta potential when calculated from this equation appears to decrease with time of penetration. The higher rates of flow with salt solutions are probably the result of the decreased thickness of the electrokinetic double layer. The percentage increase in rate of flow when the electrolyte content of the penetrating liquid is increased is inversely related to the size of the capillary.

Rapid alternations of direction of flow on diaphragms through which rate of flow has decreased (as a result of penetration in both directions) generally

results in an increased rate of flow in both directions. Spurts, in one direction only, have the same effect as alternations of direction, but to a lesser degree. Less frequent alternations of direction of flow at the same pressure have the opposite effect, causing the rate of flow to decrease more rapidly than if an equal volume of liquid had been passed through the wood or cellulose diaphragm in one direction only. After a wood section has been penetrated in one direction for some time, a very different (usually higher) rate of flow may be observed when the direction of flow is reversed. No equilibrium rate (other than zero) is approached in the penetration of softwoods.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Idaho Station] (*Idaho Sta. Bul. 239 (1941), pp. 40-45, fig. 1*).—This report includes (1) a table by P. A. Eke and L. Fenske comparing the earnings, size of business, and efficiency factors in 1939 on farms in different areas in Teton County; (2) table by Eke based on a study of the possible additional returns that would result from increasing spring run-off irrigation on Mann's Creek in Washington County and showing the farm income from sales, current expenses, depreciation, interest on capital, labor income, family living, outside earnings, operator's earnings, etc., in 1938 on a typical farm in the area, and the estimates for the same items with all-season irrigation, with a sugar beet rotation, and with surplus feed sold and fed to sheep and hogs and fed to dairy cows and hogs; (3) table by Eke comparing the income by years, 1929-35, on an 80-acre farm with 14.55 acres each in sugar beets and potatoes, with potato acreage increased or decreased in proportion to changes in Idaho potato acreage and with the potato acreage increased 50 percent with favorable and decreased 50 percent with unfavorable prices of potatoes; and (4) statement by Eke and N. Nybrotten of the need of capital and credit facilities on the Black Canyon irrigation project.

[Investigations in agricultural economics by the Kentucky Station, 1940] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 5-10*).—Included are brief statements as to findings in studies of the trends in agriculture, land use, and tobacco production in the State; the sources of income, average net earnings in 1939 on 100 farms in 5 counties in the Pennyroyal Plain area, and the average operator's net earnings in different years, 1935-39, on 23 farms; the chief sources of income and the most profitable combination of enterprises with prices at different levels on 375 farms in the Inner Bluegrass area divided into four groups on the basis of acreage; percentages of gross income used for operating expenses and interest and left for returns to operators on small farms; and the seasonal prices of spring lambs and the factors affecting such prices.

[Investigations in agricultural economics by the Fruit and Truck Station] (*Louisiana Sta., Fruit and Truck Sta. Bienn. Rpt. 1939-40, pp. 37-40, 43-47*).—In addition to results previously noted, there are included brief statements by H. Hoffsommer as to the number, source, color, and sex of strawberry pickers in the Hammond area; by R. A. Ballinger and R. M. Grigsby regarding the daily receipts, 1939-40, number of dairy herds, methods of transportation, sources of supply, and seasonal fluctuations in the supply of market milk for New Orleans; and by F. Merrick and J. N. Efferson based on data for 1938 collected from 67 produce-distributors showing the cost of production, gross and net returns per gallon, and effects of production per cow, number of cows, hours of man labor, and feed cost per cow, and the proportion of milk retailed on returns in the area near New Orleans.

[Investigations in agricultural economics and farm management by the Massachusetts Station, 1940] (*Massachusetts Sta. Bul.* 378 (1941), pp. 5-10, 55).—Findings are reported by C. R. Creek on the costs and returns of growing beans for canning on 22 farms in 1940 and as to the use, types of legumes and grass used, yields, etc., for grass silage on 72 dairy farms in 1939; by N. R. Urquhart as to the labor income and factors affecting it on 22 Bristol County commercial vegetable farms in 1939 (coop. U. S. D. A.); by Creek and R. Elliot as to the time required, methods of harvesting and packing, etc., of Iceberg lettuce on 10 farms in 1940 and on the methods of harvesting and packing tomatoes; by A. A. Brown, J. E. Donley, and M. Booth as to the factors influencing the supply of market milk and cream in the Springfield milkshed; by Brown, S. Russell, and Booth as to merchandising practices in the fruit and vegetable industry of the State; and by D. Rozman as to land use problems in Massachusetts in relation to a balanced program.

[Investigations in agricultural economics by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 7-8).—In addition to results previously noted, brief general findings are included as to the average daily sales of fluid milk in selected months, the sources of milk supply, and number of producers for the Newport market, and as to the production and marketing of potatoes for 1940 in Newport and Washington Counties.

Current Farm Economics, [August 1941] (*Oklahoma Sta. Cur. Farm Econ.* 14 (1941), No. 4, pp. 97-128, figs. 3).—In addition to the usual discussion of the agricultural situation and tables of indexes, etc., the following articles are included: Farm Income and Stability of Farm Plans, by P. Nelson and W. Wilson (pp. 102-104), including a table showing high and low variability of wheat acreage and numbers of livestock as related to profitability of farming in Garfield County, 1931-38; Changes in Oklahoma Agriculture, 1910-1940, by D. L. W. Anker (pp. 104-115), including tables showing five main types-of-farming areas, the distribution of farms by size groups, and land use, crops, and livestock on farms; and Sources and Use of Credit for Oklahoma Farmers, by G. P. Collins and E. D. Hunter (pp. 115-127), describing the sources and use of long-time, intermediate, and short-time credit.

[Economic data on Ohio agriculture], J. I. FALCONER (*Ohio Sta. Bimo. Bul.* 210 (1941), pp. 137-138).—Data based on the 1940 census of Ohio agriculture and the usual index numbers of production, prices, and income from 1913 through February 1941 are presented.

Agricultural planning, its economic and social aspects, C. F. KRAFNZEL and O. A. PARSONS (*Montana Sta. Bul.* 391 (1941), pp. 44).—The subject is discussed in sections on background for group planning; community and local participation; present situations, such as low income, lack of capital, excessive indebtedness, insufficient land and livestock, taxes, standards of living, etc.; primary problems, such as unadapted land settlement pattern, lack of adjustment between prices and costs of production, unadapted lease and credit systems, family composition, social change, etc.; and additional modifying factors, such as changes in production methods, trends in population growth, industrialization, available markets, tariffs and international trade, etc. The specific types of economic and sociological data necessary for planning activities are outlined. References on planning, markets, foreign and domestic business, finances, population, cost of living, income, and social organization are given.

Major land use problems in Martin County, Indiana, with suggestions for programs and policies, J. B. KOHLMAYER (Coop. U. S. D. A.). (*Indiana Sta. Bul.* 453 (1940), pp. 34+V, figs. 3).—The objective of this study was to focus

attention on the relationship of social and economic maladjustments to improper land use. The physical characteristics, present land use, population, education, settlement, development, etc., of the county and its agriculture; the land use classification; the public financial problems; public relief; etc., of the county are described and discussed, and suggestions made for the solution of immediate problems and for programs and policies to encourage a wider and more economic land use pattern.

Farm management for soil conservation in the Harrison area, E C WEITZELL. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 301 (1941), pp. 51, figs. 12*).—This study to determine some of the more important factors in planning improved farm management practices for soil conservation programs and the changes that have been brought about in the area by a definitely planned soil and water conservation program is based on farm management records for 200 farms in 1935 and 1936 and 195 farms in 1937. Conservation plans had been prepared for 85 of the farms. The physical and historical setting of the area is described. The general economic organization—character of farming, investments, land utilization, crop and livestock production, sources of income, receipts, expenses, etc.—is discussed. Farm-business analyses were made of the beef cattle, general, dairy, and self-sufficing farming in the area. The progress of the soil conservation program is illustrated by a comparison of planned and actual land use on 17 farms. The soil conservation program and the economic implications—adjustments and planning farms for conservation, the applicability of soil conservation, and the increasing incomes by and the factors retarding conservation—are discussed.

Many small general and self-sufficing farms produced so limited an income that exploitation of resources is necessary, and for conservation to be feasible it will be necessary that extensive commercial enterprises be abandoned and income increased by producing commodities requiring less land and more labor per unit of output. Many large beef-cattle farms are operating too extensively and utilizing an excessive acreage per animal unit, and the major need is to improve pasture and meadowlands so that a maximum number of animal units can be maintained per acre. The acreages per farm in 1935, the planned acreages for 1937, and the reported actual acreages for 1937, respectively, for the 17 specially studied farms were cropland 39.8, 36.4, and 35.9; pasture 136.4, 134.4, and 139.4; erosion-resistant crops 23.7, 18.3, and 20.5; semierosion-resistant crops 7.9, 10.2, and 7.8; and nonerosion-resistant crops 8.2, 7.9, and 7.6.

The economy of pastures in the limestone area of southern Indiana, F. V SMITH (*Indiana Sta. Bul. 454 (1940), pp. 36, figs. 19*).—The study was made to ascertain the influence of soil type on kinds, condition, and carrying capacities of pastures in the area; to determine the annual costs of permanent and rotation pastures and the annual returns for each type of pasture in terms of feed produced; and to study the methods of grazing and pasture management and the factors influencing the use of different grades of land and the resulting farm organizations. An analysis is made of 171 land use, pasture, and financial records obtained from 60 farms during 1932-36, inclusive. According to the 1935 U. S. Census, 36 percent of the land on the farms was cropland and 41 percent pasture. Of the pasture land, 41 percent was plowable, 25 percent unplowable, and 34 percent in woods pasture. The study showed that the average annual costs per acre were for permanent pastures \$1.56, varying from 84 ct. for sandstone soils to \$2.45 on the better limestone soils; rotation pastures \$2.81, varying from \$1.75 on the sandstone to \$3.15 on the limestone soils; stubble \$1.05; and meadow after-

growth \$1.04. An average of 3.8 acres of permanent and 2.5 acres of rotation pasture carried an animal unit. An acre of permanent pasture provided 48 animal unit days grazing, an acre of rotation pasture 71 days, and an acre of stubble and meadow aftergrowth 31 days. Pasture furnished an average of 42.4 percent of the total pounds of digestible nutrients consumed by all livestock at 14.3 percent of the total annual feed cost. The costs per 1,000 lb. of digestible nutrients were \$1.97 from permanent, \$2.21 from rotation, and \$1.60 from stubble and aftergrowth pastures as compared with \$10.17 for all feed, excluding pasture.

Cost, efficiency, and management of dairy cattle pastures, coast region, Oregon. W. W. GORON (*Oregon Sta. Bul. 390 (1941), pp. 20, figs. 6*).—This bulletin is the first of a series on a study made to determine the grazing value, cost of production, and relative value of different types of pasture and their place in cropping and pasture programs in different sections of the State. It is based on 138 survey records for 1934 and 1935 covering the stocking and costs of operation of bottom-land pastures in the area. Pastures on cut-over land have been discussed in Bulletin 381 (*E. S. R., 85, p. 549*).

The average length of season (days), the number of animal unit (cow) days of grazing produced per acre, and the acres used to carry one animal unit for the four types of pastures were mixed grass 238, 119, and 2.0; bentgrass 224, 138, and 1.6; clover and ryegrass 239, 200, and 1.2; and reed canary grass 209, 251, and 0.8 days, respectively. The maintenance costs per acre, per animal unit day, and per cow were for mixed grass \$8.76, 7.4 ct., and \$17.50; bentgrass \$11.06, 8.0 ct., and \$18; clover and ryegrass \$14.05, 7.0 ct., and \$17; and reed canary grass \$14.29, 5.7 ct., and \$12, respectively. The annual labor requirements per acre were 2.5, 1.3, 2.7, and 0.9 hr. (0.5 hr. horse work).

Cost and efficiency of irrigated farm pastures in eastern Oregon. W. W. GORON (*Oregon Sta. Bul. 391 (1941), pp. 24, figs. 4*).—This second bulletin of the series is based on 205 enterprise records for bluegrass and mixed tame grass pastures on 142 farms. The farms, the pasture characteristics, and the grazing value of irrigated pastures are described, and an analysis is made of the costs.

Bluegrass pastures producing less than 100 animal unit days of grazing per acre cost nearly three times as much as those producing 250 days. Small pastures tended to produce more grazing at less cost than did large pastures. Land value, taxes, cost of irrigation water, and total cost per acre had little if any relation to yield on pastures of similar type. Fencing construction costs averaged 75 ct. per rod for woven wire and 45 ct. for barbed wire. Maintenance costs averaged 6 ct. per rod for depreciation, repairs, and interest. The average number of animal unit days of grazing, acres used to carry an animal unit for 6 mo., and the animal units carried per acre were for bluegrass 152, 1.18, and 0.85, and for mixed grasses 240, 0.75, and 1.33. The average costs of maintenance per acre, per animal day, and per cow per month were for bluegrass \$7.94, 5.2 ct., and \$1.50, and mixed grasses \$11.25, 4.7 ct., and \$1.41, respectively.

Costs and grazing values of Willamette Valley and southern Oregon farm pastures. W. W. GORON (*Oregon Sta. Bul. 392 (1941), pp. 51, figs. 15*).—This third bulletin of the series is based on data regarding 74 hill, 238 valley, and 100 special pastures in the Willamette Valley and 25 hill and 12 irrigated pastures in southern Oregon. Appendixes include data as to fence costs in the Willamette Valley and the methods used in expressing pasture yields in terms of feed equivalent. Some of the data are summarized in the following table:

Pasture maintenance costs and returns

Kind of pasture and region	Maintenance cost		Animal unit days of grazing per acre	Length of pasture season	Acres required to carry one animal unit for the season	Land value per acre
	Per acre	Per animal unit day of grazing				
Willamette Valley:						
Hill pastures:		<i>Cents</i>	<i>Number</i>	<i>Days</i>	<i>Number</i>	
Native grass.....	\$1.46	3.5	42	270	6.4	\$19.20
Tame mixed grass.....	2 10	3.5	59	270	4 6	23 60
Valley pastures:						
Native grass.....	2.49	5 0	50	270	5.4	33.60
Tame mixed grass.....	4 74	4.9	96	210	2.2	60.80
Ryegrass.....	4 86	5.3	52	255	3.1	53.60
Alfalfa.....	12.40	5.2	240	160	.7	102.20
Red and alsike clover.....	8.14	5.0	164	141	.9	102 80
Special pastures:						
Reed canary grass.....	9.27	3.1	302	195	.6	123 60
Ladino clover (irrigated).....	21.60	6.3	342	207	.6	153.00
Sudan grass.....	12.20	7.8	156	101	.6	52 20
Rape.....	9.44	10.5	92	106	1.2	73.60
Southern Oregon:						
Douglas County:						
Hill pastures.....	.83	2.7	34	360	10.6	11.20
Jackson County:						
Irrigated pastures.....	11.48	5.5	210	183	.9	92 20

Dairy management in California, A. SHULTIS (*California Sta. Bul. 640* (1940), pp. 94, figs. 4).—This bulletin summarizes information on dairy enterprise management obtained in past studies and is based chiefly on the data in approximately 1,000 detailed dairy-enterprise records obtained by the extension service of the State since 1925. Dairying in the principal sections of the four dairy districts of the State—irrigated valleys, coast counties, southern California, and mountain valleys—is described. Production per cow and factors affecting it; net stock income per cow, including replacements, bull service, cost of raising heifers, etc.; labor, facility, and miscellaneous costs; and effects of size of herd and feeding on expense and net income per cow are discussed. Standards of costs for market and manufacturing milk are given for the San Joaquin Valley and Sonoma and Marin Counties.

The competitive position of dairying in Michigan, R. V. BAUMANN and E. B. HILL (Coop. U. S. D. A.). (*Michigan Sta. Spec. Bul. 309* (1941), pp. 38, figs. 11).—This study is one of the series on supply responses in milk production (E. S. R., 85, p. 684). Detailed farm records for the year ended April 30, 1936, were obtained from 97 farms in 2 townships in Lenawee County and 78 farms in Mecosta County. The present type of farming, production trends of different crops and types of livestock, and milk production in the State and the two areas are discussed. The farms were studied by the farm budget procedure. Tables show for a selected farm in each area the 1936 organizations and returns and the estimated organizations and the returns for 1946 under different conditions and alternatives as to organizations.

Using 1936 milk prices as normal, the milk production in 1929 and the estimated production in 1946 with (1) no change in normal price relationships of farm products, (2) a 20-percent increase in milk price relative to other farm products, and (3) a decrease of 20 percent in the relative price of milk to other products are for the Lenawee area 84.6, 114, 124, and 103 percent; the Mecosta area 89.5, 115, 128, and 111; and for Michigan 90.2, 115, 125, and 107 percent.

An economic analysis of the production of canning factory tomatoes in Indiana. M. G. SMITH, L. ROBERTSON, J. C. BOTTUM, and F. V. SMITH (*Indiana Sta. Bul.* 456 (1940), pp. 36, figs. 22).—The production, trends in acreage, and prices and factors affecting them in the United States and Indiana are discussed. Records for the period 1934-39 as to costs, returns, and growing practices for 797 fields on which tomatoes were grown for manufacture in different sections of the State are summarized and analyzed to determine the labor and power requirements, costs of production, and profits and factors affecting each.

From 1913 to 1939 the average annual increase in the acreage in Indiana for tomatoes for manufacture was 2,251 acres. There was a cyclical movement of about 6 yr. in the acreage. The average price received by growers, 1928-37, was \$11.20 per ton. The average labor requirements, 1934-39, varied from 86 to 100 hr. per acre in different sections and the power requirements from 24.2 horse and 3.7 tractor hours to 38.3 horse and 1.6 tractor hours. The average costs per acre in growing, harvesting, and marketing were \$61.09 in the central part of the State, \$52.18 in the northwestern part, and from \$38.13 to \$46.50 in three areas of the southern part. The returns per hour of labor were 71, 28, and from 6 to 31 ct., respectively, in the different areas. Man labor constituted from 35 to 46 percent of the total costs of production and marketing. Costs and returns varied widely among the farms in each of the five areas studied. For 114 fields in the central part of the State in 1939 the net returns per hour of man labor above all cost except labor varied from losses on 11 fields to more than 75 ct. on 7 fields. Generally for all areas yields, profits, and returns for man labor were higher on large farms and large fields. Labor returns per hour in 1939 were 56, 39, and 11 ct., respectively, on high-, medium-, and low-yielding fields, from 35 to 54 ct. on different types of soil, and 47, 53, 38, and 46 ct., respectively, for tomatoes following corn, hay and pasture, small grain, and miscellaneous crops.

An economic analysis of the production of peppermint and spearmint oils in Indiana. M. G. SMITH and L. ROBERTSON (*Indiana Sta. Bul.* 459 (1941), pp. 31, figs. 16).—From 1934 to 1939 (except 1935), 540 records on costs, returns, and practices in producing peppermint oil were obtained from Indiana farmers. In 1939 analyses of the soils in 107 fields were made and 99 farms were inspected for insects and diseases. An analysis is made of the labor and power requirements, the cost items, factors affecting profits—yields, soils, preceding crop, size of farm and fields, variety, use of fertilizers, cultural practices, etc.

The average yield of peppermint and spearmint oil, 1929-39, was 18.6 lb. per acre and the average price, 1927-39, \$2.02. For the period 1936-39, the average cost per acre of growing on new settings was \$47.57, and the average returns were value of oil \$39.35, value of roughage \$1.30, and value of stand \$11.22. The profit was \$6.79 and the labor returns \$22.66. For old settings the cost of growing and decrease in value of stand was \$42.17 and the value of oil \$47.56, value of roughage \$2.17, value of roots or plants used \$2.50, profit \$10.06, and labor returns \$20.35. Of the total costs on new settings, plants and roots comprised 18.1, man labor 33.3, distilling charge 10, and land use 11 percent. On old settings the items were 1.1, 24.6, 13.3, and 14.3 percent, respectively, and 19.3 percent for decrease in value of stand.

Cotton-price relationships and outlets for American cotton. L. D. HOWELL (*U. S. Dept. Agr., Tech. Bul.* 755 (1941), pp. 40, figs. 15).—"Data on the relation of prices to the supply, consumption, and production of cotton and on variations in prices on the basis of quality and location are assembled and presented in this bulletin." The relation of cotton prices to the supply and demand, price differences for quality and location, the relations of changes in prices of

American cotton to other growths and of price ratios to supply ratios and consumption ratios are analyzed and discussed.

An increase of 1 percent in the world supply of cotton tends to decrease the seasonal average price about 2 percent. With the carry-over making up less than 50 percent of the total world commercial supply, gross farm income from cotton for the world tends to be greater for a small crop than for a large crop. During 1921-38, American cotton made up about 54 percent of the world supply, and prices in American markets were affected more by changes in the American supply than by changes in other growths. Decreases in the size of the American crop tend to reduce the carry-over and lessen the depressing effect of the carry-over on prices. In recent years the effect of decreased carry-over has been offset in whole or part by the influence of Government loans to growers in the United States. The extent to which United States growers can afford to expand production and sell at reduced prices in order to compete with growers in other countries depends largely on the alternatives available to American producers. Studies indicate that during the period 1923-32 average returns to labor in the Cotton Belt were less from alternative crop and livestock enterprises than from cotton. The very inelastic consumer demand for cotton means that prices may change considerably without a comparable immediate effect on mill consumption.

Expansion in production in other countries increases the difficulty of the United States regaining and holding a fair share of the world market. The possibilities of improving the competitive position of the United States by reducing costs of production and improving quality might well be given increased emphasis in conservation and quality adjustment programs. Changes in the relative supply and demand situation for cotton of various growths and qualities of the same variety or growth result in substantial changes in prices over comparatively short periods. Price variations on the basis of quality usually are greater in central and mill markets than in local markets. This limits the incentive for improvement of quality grown and may adversely affect the competitive position of American cotton.

Uses for cotton, D. M. ELLIS (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 91 (1941), pp. VI+129).—This bibliography of 785 selected references in the English language, 1933-July 1940, supplements the one previously noted (*E. S. R.*, 69, p. 620). The references are classified according to specific uses of cotton.

Market organization and costs in the St. Louis wholesale fruit and vegetable market, H. M. HAAG and L. H. SCHWEITER (*Missouri Sta. Res. Bul.* 327 (1941), pp. 52, figs. 2).—This study was made to determine the organization and facilities of the market, the sources of supply, sales outlets, costs of handling products, and the relationships between costs and various factors affecting them. Data regarding the organization and operation of the market were obtained from 82 operators by means of a survey schedule and as to truck and railway receipts from the U. S. D. A. Agricultural Marketing Service; those for analyses of costs and margins were obtained from the accounting records of 13 wholesale and 6 retail firms in the Third Street Market. The importance, the ownership, space, facilities, methods of transportation, etc., of the market are described. An analysis is made of the margins and of selling, general, and credit expenses, rent, drayage, and salary and wage costs of the 13 representative wholesale and the 6 retail firms and the factors affecting such costs. In the analysis the firms are grouped by size and the costs determined per \$100 of sales and number of packages handled.

For the wholesale firms the average expenses per \$100 of sales were selling—salaries, wages, salesroom, equipment, telephone, telegraph, interest, and advertising—\$3.62; general—salaries, wages, supplies, taxes, insurance, travel, etc.—\$1.56; credit—bad debts, salaries, wages, and interest—67 ct.; drayage \$1.42; special handling 36 ct.; and total \$7.63. The average margin was \$7.86. The margins and costs per 100 packages were \$12.85 and \$12.03. For the retail firms the expenses per \$100 of sales were selling \$6.17, general \$2.54, drayage \$3.02, credit 60 ct., special handling 30 ct., and total \$12.63, and the margin \$12.40. For the wholesalers, costs and margins declined as size of business increased. Firms handling high-priced packages had the higher margins and costs per package. The 13 wholesale firms made about 84 percent of their sales on credit, the average period in 1939 being 17 days. For the retail firms the figures were about 78 percent and 16 days, respectively.

Prices and receipts of fruits and vegetables sold on the Terre Haute producers market, K. I. FAWCETT and F. C. GAYLORD (*Indiana Sta. Bul.* 455 (1940), pp. 15, figs. 7).—Data as to the origin of produce, whether grown or purchased for resale, amounts of each product delivered and sold and to whom sold, sales prices, etc., were obtained by two field men at the market of the Terre Haute Vegetable Growers' Association for a full market season—May 1–November 6, 1937. Tables and charts show by months the amounts and value of different products sold; the percentages sold by growers and dealers or truckers and the percentages purchased by wholesalers, grocers, peddlers, and consumers; the receipts from other States and from leading Indiana counties; and the relations of receipts and prices for selected products.

Eighty-seven percent of all products was sold by producers. Wholesalers purchased 29 percent of the produce, retailers 31, peddlers 31, and consumers 9 percent. Early in the season prices were relatively high but fell as supplies increased, and in many cases local producers sold on a falling market due to the fact that their products were not ready for the early market.

Market outlets for New Mexico onions, R. P. CALLAWAY (*New Mexico Sta. Bul.* 277 (1941), pp. 31, figs. 7).—The trends in acreage and production in the United States, different areas, and New Mexico, the seasonal competition, prices, the influence of variety on prices, marketing costs in New Mexico and other sections, and the Texas and Oklahoma markets as outlets for New Mexico onions are analyzed and discussed. The data as to acreages and production were obtained mainly from the reports of the Crop Reporting Board and those relating to shipments, unloads, and terminal market prices from the U. S. D. A. Agricultural Marketing Service.

The average acreage of commercially grown onions in the United States, 1935–39, was 144,000, being an increase of 69 percent from 1925 to 1929. Most of the increase was made in the early and intermediate crop districts of Texas. The crop increased from 12,400,000 to 15,800,000 100-lb. sacks. The most important commercial areas in New Mexico are the Mesilla Valley and a section of the Pecos Valley near Roswell, which have an estimated annual production of from 200,000 to 250,000 50-lb. sacks. The average Cincinnati price, 1936–39, for U. S. No. 1 Texas Yellow Bermuda onions declined from about \$2 per 50-lb. sack during the first 10 days of April to \$1 for the first 10 days of June. The average price of Yellow Valencia onions declined from \$1.35 per 50-lb. sack in August to \$1.10 in October. To cover present marketing costs on rail shipments from Las Cruces and Albuquerque, a selling price of 90 ct. per 50-lb. sack at Chicago and \$1 at Cincinnati would be required. On shipments from Roswell, 68 and 85 ct. would be required.

Packaging problems of eastern apple growers, W. R. WHITACEE (*Pennsylvania Sta. Bul. 409 (1941), pp. [1]+14, figs. 4*).—This study to determine the type of package best adapted to Pennsylvania conditions is based on 525 sample containers weighed in cold storage during the latter part of March and April 1940 and 1,180 samples weighed in December 1940. Tables show for different sized Delicious, Rome, Stayman, and York Imperial apples the average weights in December 1940 in the four types of containers; the average weights of apples in containers of different sizes in March, April, and December 1940; and the average net weights of 2.5-in. apples of different varieties in the four types of containers and of specified sizes of Stayman and 3-in. and upward apples in 1½-bu. boxes packed face-and-fill and wrap-and-place.

The ranges in weight and the average weights of all varieties and sizes, December 1940, were bushel baskets 39–51.5 and 45 lb., bushel boxes (wrap-and-place pack) 37.5–48 and 43.3, 1½-bu. boxes (face-and-fill pack) 39–52.5 and 46.6, and 1½-bu. boxes (face-and-fill pack) 42.5–55.5 and 50.8 lb. The comparable weights for March and April 1940 were 42.9–48.5 and 45.9, 30.1–45.6 and 41.5, 40.8–48.6 and 43.7, and 43.6–50.5 and 47.3 lb. The study showed that 1½- and 1½-bu. boxes do not contain one-eighth and one-fifth more apples than bushel baskets; the variation in quantity packed by individual growers in a container was frequently more significant than the variation between average quantity packed by all growers in the three smaller types of containers; there was little difference in the quantity of apples packed in a 1½-bu. box using face-and-fill or wrap-and-place methods; and there was a tendency to discontinue the use of the 1½-bu. box.

Marketing New York livestock, W. M. CURTISS and E. H. MATZEN ([*New York Cornell Sta. Bul. 744 (1940), pp. 36, figs. 10*]).—This bulletin is a condensation of the findings in several studies made by the authors. It describes the types of markets for livestock used by New York farmers and discusses the markets for and sales and purchases of dairy replacement cows, cull cows, veal calves, horses, hogs, sheep, lambs, and wool.

Livestock auctions in Minnesota, A. A. DOWELL and G. ENGELMAN (*Minnesota Sta. Bul. 352 (1941), pp. 39, figs. 19*).—This study deals with the development of livestock auction markets; the volume, character, and seasonality of the business handled; the organization and method of operation; the kind of services rendered and the charges made; and the extent to which auctions serve as effective marketing agencies. Data regarding 42 auctions were obtained from the State Livestock Sanitary Board, and complete information was available for 36 auctions personally visited during June, July, and August 1939. The development of auctions, the reasons for growth, volume of business done, the purposes for which livestock was sold, the seasonal distribution of the sales of different kinds of livestock, the areas served, the facilities and their ownership, the operation of the auctions, the public regulations, etc., are discussed, and an appraisal is made of the livestock auctions in the State.

From 1919 through 1940, 97 auctions were organized in the State, but only 45 were active on December 31, 1940. During 1938, 150,428 animals were handled by 22 auctions, of which 51.1 percent were cattle and calves, 33.6 hogs, 12.1 sheep and lambs, and 3.2 percent horses and mules. Of the total number, 52.4 percent was sold by farmers, 39.2 by dealers, and 8.4 percent by auction operators. Farmers purchased 61.4 percent, dealers 37.4, and auction operators 1.2 percent. Of the animals sold in 1938 at 14 auctions, 80.7 percent were consigned from a distance of 25 miles or less and 12.2 percent from a distance of from 26 to 50 miles.

The business of milk retailing by producer-distributors in New York State, E. M. HUGHES ([*New York Cornell Sta. Bul. 741 (1940), pp. 85, figs. 19*]).—

The purpose of this study was "to ascertain the amount and variation of costs and profits in the distribution of milk by a representative group of producer-distributors in New York State; to measure the effect of various factors upon these costs and profits, so as to determine the principles of successful organization and management for small milk-distribution enterprises; and, in general, to ascertain the conditions under which farmers are most likely to succeed in the distribution of their own milk." Detailed records of the retailing operations for the fiscal years ended during the period January 1-June 30, 1936, were obtained from 92 producer-distributors. In the analysis the records were segregated into four groups on the basis of location. The economic conditions during the period are described. Analyses are made of the principal products sold, prices for milk purchased, selling prices, sources of milk supply, butterfat tests, sources of capital, costs of different types of plants, containers, selling and delivery, administration, and other costs, effects of volume and type of business, labor, route, and capital efficiency, miscellaneous factors affecting costs and profits, and the relation of farm organization and retail milk enterprises to labor income of the farms producing milk.

The average sales of the 92 producer-distributors was approximately 350 qt. of milk equivalent, of which about 80 percent was fluid milk and 20 percent cream and byproducts; 64 percent was sold at retail prices. Two-thirds of the milk was produced by the distributors. The total sales and percentage of milk produced by the distributors varied little during the year. The average investment in the distribution enterprise was \$4,042, including \$800 in accounts receivable. Distribution costs per quart of milk equivalent averaged 4 ct. The cost of distribution for retail milk in bottles was slightly over 5 ct. per quart. Approximately 50 percent of the total distribution cost was for selling and delivery and slightly over one-third for plant operation. Labor costs were nearly 50 percent of the total costs. Net returns (profits) varied from a loss of nearly 3 ct. per quart to a profit of 4.5 ct. Volume of business and labor efficiency were the most important factors affecting profits. The average income of the producer-distributors after all business expenses were deducted was \$1,927.

Farmer cooperation in southwest Virginia, E. L. MORGAN and T. N. GEARHEAD (*Virginia Sta. Bul. 331 (1941), pp. 46, figs. 11*).—This physical inventory and appraisal of cooperation in 15 counties in the southwestern part of the State was made in cooperation with the Tennessee Valley Authority. The area and its population, its agricultural background, and the development of cooperative organizations are discussed. The present status of the cooperatives—number, location and types of enterprises, organizational structure, educational program, and financial structure—is discussed. The statistical and business analyses are included, the associations being grouped as follows: Purchasing (6), of which the volume of business of 3 was from \$25,000 to \$60,000, of 2 from \$100,000 to \$125,000, and 1 over \$600,000; livestock (13); wool pools (3); and purebred sheep breeders, strawberry marketing, bull, and renting farm equipment (each 1).

While a number of reasonably strong associations exist in the area, the following weaknesses are cited as existing in one or more active associations and as causes of failure of inactive associations: No requirement of capital investment by members, no definite plans as to accumulation of capital from net income; operation on too small margins; inadequate educational programs; incomplete accounting records; inadequate supervision by directors; improper allocation of surplus to members; too much credit granted; lack of membership interest; competition between cooperatives; insufficient business; lack of

capital; too low inventory turn-over; lack of incorporation; manager also a director; etc.

Minnesota cooperative oil associations, E. F. KOLLER and O. B. JESNESS (*Minnesota Sta. Bul.* 351 (1941), pp. 58, figs. 16).—A detailed analysis was made of the organization and operation of 92 associations scattered throughout the State and depending chiefly on farmer patronage. The State and Federal laws applying to cooperative associations are described. The capital requirements, sources of capital, financial ratios, and methods of operation—supplies handled, purchasing, selling and service, and accounting methods, price policies, inventory control and shrinkage, and credit management—are discussed. An analysis is made of the operating efficiency—sales, cost of sales, gross margin, operating expenses, income, etc. The cooperative wholesale associations are briefly described. Suggestions are made regarding the major needs of the associations.

In 1939 sales of the 92 associations averaged \$69,627 and net income averaged 6.39 percent of the sales, ranging from a loss of 4.14 to a profit of 13.89 percent. About 77 percent of the net income was set aside for patronage dividends, about 8 percent used to pay cash dividends, and the remainder retained as surplus and reserves. The 20 associations with the highest returns had the larger annual sales, higher gross margins, and lower operating expenses per dollar of sales. Net assets averaged \$26,031 per association, ranging from \$3,300 to \$206,000. Of the total capital, 41.3 percent was provided by creditors and 58.7 percent by members. Since 1925 gross margins as a percentage of sales have gradually decreased and operating expenses have tended to increase.

North Dakota farm prices (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 6, pp. 29-30).—Tables of the usual type show the average prices received by farmers and the indexes of North Dakota agriculture, by W. L. Ettesvold, for April 15, and by Ettesvold and P. V. Hemphill for June 15, 1941.

Grain prices and the futures market: A 15-year survey, 1923-1938, G. W. HOFFMAN (*U. S. Dept. Agr., Tech. Bul.* 747 (1941), pp. 78, figs. 30).—An appraisal is made of the more important developments under the Grain Futures Act of September 21, 1922, and its amendments. This bulletin brings together the results of earlier studies and is limited to grain and particularly to futures trading on the Chicago Board of Trade. The several sections discuss post first World War prices, the influences of the general price level and changing supplies and demand on cash grain prices, the relation of futures to grain prices, visible supply and hedging, importance of large-scale speculators, and delivery problems. The following tendencies are indicated:

"(1) Large net trades (or large changes in net positions) made by single interests in brief periods of time usually cause prices to move with the trades, i. e., if purchases, prices advance; if sales, prices decline. (2) When the net of small speculative trades mounts to large figures in brief periods of time prices may move with the trading. This does not often happen, however, since it requires continually advancing prices to unusual levels to encourage reckless buying by the general public. (3) As a rule the net of small speculative trades moves opposite to prices, i. e., small traders sell on balance as prices advance and buy on balance as prices decline. (4) The larger the net trades made by single interests in brief periods of time the more certain it becomes that prices will move in the same direction as the trades. (5) Large long commitments held by single interests in a maturing future, when the deliverable supply is relatively small, usually cause that future to advance unduly in price relative to more distant futures."

New quantity indexes of the foreign trade of the United States in agricultural products (a preliminary presentation), R. B. SCHWENGER ET AL. (*U. S. Dept. Agr., Off. Foreign Agr. Relat., F. S. 85 (1941), pp. [2]+61*).—This is a preliminary presentation of a revised series of monthly quantity indexes of exports from the United States and a new series for imports. The method of compilation of the indexes is described. Tables show for all commodities, cotton fiber, unmanufactured tobacco, fruits, wheat and flour, other grains, cured pork, and lard the average quantity indexes of exports, 1900–14, the annual and monthly indexes, 1915–40, unadjusted for seasonal variations and from 1924 to 1940 adjusted for such variations; and for the same periods the annual and monthly quantity indexes of imports, adjusted and unadjusted, for all commodities, complementary and supplementary products, sugar and molasses, hides and skins, dairy products, dutiable wool, vegetable oils and oilseeds, grains and grain products and feeds, and tobacco leaf.

Trade between the United States and Canada in fresh fruits and vegetables and the effects of the trade agreements (*U. S. Dept. Agr., Off. Foreign Agr. Relat., F. S. 86 (1941), pp. [2]+48, figs. 3*).—“This study presents an analysis of the trade between the United States and Canada in fresh fruits and vegetables for the 15 yr. 1925–39 from the points of view of (1) the value and volume of the trade. (2) participation of the various States in United States exports, (3) United States producing sections affected by imports from Canada, (4) tariff policy, and (5) significance of duty reductions in the trade agreements of 1936 and 1939.”

Report of the President of the Commodity Credit Corporation, 1940, C. B. ROBBINS (*U. S. Dept. Agr., Commodity Credit Corp. Rpt., 1940, pp. 22*).—This first annual report includes a summary description of the Corporation and its functions and reviews the loan programs for fiber, grain, and general crops. The balance sheet and operating statement of the Corporation as of June 30, 1940, and tables showing the loans by commodities and by States are included.

RURAL SOCIOLOGY

Some social implications of the scientific method, L. H. MACDANIELS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 38 (1941), pp. 718–726*).—The author states that “with most of the world at war or near war, it is all too obvious that our control of physical forces has far outstripped the capacity or at least the will of the human race to manage their affairs in a satisfactory way.” He emphasizes the universality of natural law and the susceptibility of the use of the scientific method in the social as well as in the natural field. It is concluded that the scientific method is the most effective approach in dealing with our problems and can be taken as a working hypothesis upon which we can base our activities. Until we can find a better hypothesis, it will go far in giving meaning to our universe in fields where otherwise chaos and confusion seem to exist.

The concept, social processes: Its meaning and usefulness in the study of rural society, P. H. LANDIS. (Wash. State Col.). (*Rural Sociol., 6 (1941), No. 1, pp. 59–62*).—The author concludes that “we cannot approach any problem of contemporary rural life and go far beyond a mere description of fact and structure without being driven to thinking in terms of processes. Analysis inevitably reveals processes.”

[Investigations in rural sociology by the Kentucky Station, 1940] (*Kentucky Sta. Rpt. 1940, pt. 1, pp. 10–11*).—The movement of population to and

from farms and the selection of rural committee members of the land use planning project are briefly described.

The unincorporated hamlet: An analysis of data sources, G. T. TREWARTH. (Univ. Wis.). (*Rural Sociol.*, 6 (1941), No. 1, pp. 35-42, fig. 1).—"The few studies of American hamlets now in existence have been primarily concerned with the survival of these tiny agglomerations—have good roads and automobiles caused them to be superfluous? In all of these studies, Dun and Bradstreet's reference books of commercial ratings have been the principal data source. In some, Rand McNally's and Cram's atlases provided supplementary data. For 12 counties in southwestern Wisconsin, where [the author was] making a field study of hamlets, counts of these settlements were made from the 3 sources noted above for 13 irregularly spaced years beginning in 1882 and terminating in 1940. . . . The results are such as to raise serious doubts whether the published sources are sufficiently reliable in their hamlet counts to permit the data to be used in decade to decade comparisons of hamlet numbers."

Does decentralized industry mean greater security? The case of Massachusetts, J. USEEM (*Rural Sociol.*, 6 (1941), No. 1, pp. 43-56).—One of the crucial questions involved in the decentralization of industry is its effect on the security of rural populations and communities. In spite of the evidence of unfavorable developments in this respect, there are cogent reasons for decentralizing industry. Indications of a national trend in this direction suggest the need for additional protections for rural America.

Decrease in agricultural population: Its causes and effects [trans. title].—I, E. VON HOFSTEN; II, A. OLSSON (*K. Lantbr. Akad. Tidskr.*, 80 (1941), No. 3, pp. 251-264, figs. 6; pp. 265-269; *Eng. abs.*, pp. 264, 269).—In the first contribution it is pointed out that the real rural population of Sweden has been decreasing since 1880, a fact which has not been generally noticed as the official statistics have only recently begun to give figures applying to rural districts proper. This decrease has been due partly to the falling birth rate and partly to migration. A large proportion of the emigrants formerly used to go abroad, but at the present time there is merely internal migration from the rural districts to towns or other agglomerations. In spite of extensive losses by migration, the adult rural population has not yet been appreciably reduced as it is the number of children which has dropped, but ultimately the continuance of this trend must result in a heavy reduction also of the adult population.

The second paper is based on observations made in the northeastern part of the County of Västmanland, a pronounced farming district with relatively large holdings that has never been overpopulated. The migration of the agricultural population to towns and other agglomerations was slight up to the turn of the century, but in consequence of the progressing industrialization it began to assume larger proportions after 1910 and has continued at an increasing rate.

Selective aspects of rural migrations, N. P. GIST, C. T. PIRLHALL, and C. L. GREGORY. (Univ. Mo. et al.). (*Rural Sociol.*, 6 (1941), No. 1, pp. 3-15, figs. 2).—"The present study was undertaken for the purpose of testing the hypothesis that a selection of intelligence occurs in rural-urban migrations. The scholastic records, together with data on place of residence in 1938, were secured for 5,464 former rural high school students who were in attendance between 1920 and 1930. For this sample it is apparent that a certain amount of selection does occur, and that the differences between the mean scholastic indexes of the rural-farm, rural-nonfarm, and urban groups are statistically significant. When the data were analyzed in terms of 'range of migration,' a rough measure of distance between the place of original residence and the place of residence in 1938, significant differences between the mean scholastic indexes were observed.

Females had a considerably higher scholastic rating than males, but the pattern of the selective process seems to be much the same for both sexes. The evidence seems to indicate that insofar as scholastic achievement is a measure of individual competence, the cities are profiting by the urbanward migration."

Characteristics of migrants, T. L. SMITH. (La. State Univ.). (*South-west. Social Sci. Quart.*, 21 (1941), No. 4, pp. 335-350).—The author defines migration and discusses types of migration, race, residence, age, sex, order of birth, physical fitness, and intelligence.

Rural mobility in selected areas, 1926-1936, J. P. GREENLAW, A. I. HELLEBUST, and D. G. HAY (*North Dakota Sta. Bimo. Bul.*, 3 (1941), No. 6, pp. 16-20).—The results of this study indicate that there was a turn-over, or in-movement and corresponding out-movement, during 10 yr. of about one-fourth as many heads of families as were resident in the areas surveyed on January 1, 1936, and that about one-tenth as many as were resident in 1936 had moved into the areas and out again within the 10-yr. period.

Sources and distribution of the farm population in relation to farm benefit payments, T. L. SMITH and R. W. ROBERTS. (La. State Univ.). (*Jour. Farm Econ.*, 23 (1941), No. 3, pp. 607-618).—The authors show that the country is the producer of population while the cities are its consumers. In a 4-yr. period, 1936-39, the Government distributed funds to farmers amounting to about \$61 per farm person, the payments ranging from \$197 per farm person in North Dakota to \$5 per farm person in Rhode Island. In general, the South received the smallest payments. It is recommended that "the distribution of all Federal benefit payments to the States should be in proportion to the sizes of their farm populations. These Federal contributions should not be paid directly to the farm operator but should be channelized into the support of essential services now financed by local taxation, with a consequent reduction in farm taxes. . . . The principle of equalization should be adopted on a Federal scale so that areas benefiting from rural-urban migration would contribute a portion of their share in the provision of such services as modern schools and public health facilities."

Population and land relationships in Washington County, Rhode Island. (Coop. U. S. D. A.). (*Rhode Island Sta. Rpt.* [1940], pp. 56-62).—This study presents summaries of the people-and-land relationships and of occupational characteristics of rural households, frequency of change of place of residence, levels of living, and social participation.

Part-time farming in a rural-industrial area of Louisiana, C. A. BOONSTRA and H. JACKSON (*Louisiana Sta. Bul.* 333 (1941), pp. 18, fig. 1).—Data were obtained from 28 residential (not operated for cash income), 20 semicommercial (only incidental cash sales), and 16 commercial (cash sales \$150 or more) farms operated by employees of a large paper mill at Bogalusa, La. The industrial employment and social characteristics of part-time farmers, the organization of farms studied, the home use of products, etc., are discussed. Analysis is made of capital requirements, indebtedness, expenses, and earnings for the three types of farms, and the factors affecting earnings and attitudes of the farmers toward part-time farming.

The average for the three types of farms for real estate and other property investments were \$1,910, \$2,669, and \$3,580, the value of farm privileges \$218, \$339, and \$357, and the returns for operator's labor \$158, \$187, and \$257. Returns for operator's labor increased with size of family, with acreage in crops up to 12.9, value of farm privileges up to \$499, and in cash receipts. The chief objections made to part-time farming were expense of transportation and lack of conveniences.

"In general the conclusion may be drawn that the paper mill worker on a 6-hr. shift, living on a 25-acre farm, with 10 acres of cropland on which are grown corn for 2 cows, 1 work animal, 5 hogs, and 30 chickens, with a few sweetpotatoes, and 0.5 acre of garden for the family food needs, has the optimum size part-time farm."

The German settlement in Cullman County, Alabama, an agricultural island in the Cotton Belt. W. M. KOLLMORGEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, pp. [1]+66, figs. 4*).—The author reports the respective contributions on social, economic, and agricultural advancement in the county of German immigrants and Georgia "crackers." In contrast with the Georgians, the Germans, though they have lost much of their Old World culture, still stress diversification, live more adequately at home, and belong to the Lutheran or Catholic church. Gradually they are becoming more and more like the native Georgians in cultural elements. They gave up beer and wine because, as they explained, they had no money to buy them. There is now less singing, less dancing, less beer, and less comradeship. The older Germans feel a little lonely and out of place. While the Germans do not boast of their achievements in Cullman County, their success is attributed by their neighbors as due, in large part, to thrift and hard work.

The distribution of the German pioneer population in Minnesota. H. BINDER-JOHNSON (*Rural Sociol., 6 (1941), No. 1, pp. 16-34, maps 2*).—The purpose of the study was to determine the proportion of German stock (German-born persons from Europe and American-born children of German parents) in the total population in Minnesota for the years 1860 and 1870. The percentages of German stock are shown for the townships, in six different shades on two maps. "The maps reveal that German pioneers concentrated around the bend of the Minnesota River. German population centers were in Carver, Sibley, Nicollet, and Brown Counties. The same townships in Carver, Sibley, and Brown Counties showed heavy percentages in 1860 as well as in 1870, thus demonstrating that Germans preferred to settle among Germans rather than to move with the frontier."

Rural planning: Its social and community organization aspects. R. E. WAKELEY. (Iowa State Col.). (*Rural Sociol., 6 (1941), No. 1, pp. 62-67*).—The author concludes that this is a time of unparalleled opportunities for rural sociologists. They must be prepared to present sociological information on short notice, do the necessary research, and work with planners.

Public welfare and family social work in rural areas. W. J. HAYES (*Rural Sociol., 6 (1941), No. 1, pp. 57-59*).—The author suggests that in the meaning of public welfare, melioration is one thing while the prevention of dependency is another.

Sickness and medical care among the rural population in a petroleum-producing area of Arkansas. I. C. WILSON (*Arkansas Sta. Bul. 413 (1941), pp. 49*).—"In the Standard-Umsted community, a typical petroleum-producing area, 202 white families with a membership of 1,065 persons, and 46 Negro families with a membership of 185 persons, were interviewed as to their state of health, the costs and types of medical care utilized, and their indebtedness for medical care. There were no doctors or registered nurses in the community, but in the town of Smackover, 5 miles from Standard-Umsted, there were 3 resident white physicians, 1 itinerant Negro physician, 1 itinerant Negro dentist, 7 registered nurses, several midwives, 2 clinics, and 1 Negro convalescent home." There was an average of 4.9 illnesses per family during the year preceding the date the data were taken and 1.2 per capita. The average time lost from work, play, or school was 43.3 days per family and 10.6 per capita. The incidence of illness

was very high in the first 5 yr. of life and after the age of 50. The total cost for medical services for all members of all families averaged expenditure of \$107.44 per family and \$26.47 per person. Expenditures for physicians' services were 35.2 percent of the total amount, for sickness and accident insurance 17.7, hospitalization 12.4, dental care 9.5, unprescribed medicine 8.1, prescribed medicine 4.9, oculist's services and glasses 2.9, chiropractor's services 1.2, registered nurses 1.7, transportation 0.7, hired help during sickness 3.7, ambulance 0.2, practical nurses' care 0.1 midwives' care 0.1, and all other medical care 1.6 percent. Expenditures for medical care by the village families exceeded that of country families by \$21.71 and that of camps by \$23.63.

White families used the doctor 1.75 times as often for illness as did Negro families. Of the Negro families, 10.9 percent used herbs as compared to 1.5 percent of the white families. The infant and premature death rate in the Standard-Umsted community was abnormally high—over a 5-yr. period 37 percent of all deaths occurred in the first year of life. The median cost for funerals was \$125. Almost one-half (48.0 percent) of the families subscribed to burial insurance societies, which were patronized more by Negroes than by whites, but were well patronized by both groups.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Directory of organization and field activities of the Department of Agriculture, 1941, E. STEPHENS (*U. S. Dept. Agr., Misc. Pub. 431 (1941), pp. IV+243*).—Part 1, the organization list, is quite complete for the research personnel, but only supervisory personnel are listed at each location for other activities. Part 2, field activities, is a geographical directory listing by cities and towns the location of employees in the States, Territories, possessions, and foreign countries. The directory supersedes Miscellaneous Publication 376 (E. S. R., 83, p. 287).

Principles of economic geography, E. HUNTINGTON, assisted by F. E. WILLIAMS, S. VAN VALKENBURG and S. S. VISHER (*New York: John Wiley & Sons; London: Chapman & Hall, 1940, pp. X+715, pls. 2, [figs. 233]*).—"This book begins with the simplest elements of economic geography and proceeds upward to those that are most complex. Everywhere, however, it goes back not merely to the plants, animals, and minerals that provide the basic commodities and give rise to the basic industries, but further to the physical conditions of earth, air, and water. It explains how these conditions exert a biological effect by limiting or encouraging the growth and development of plants, animals, and even human beings. Then it goes on to show how the combination of physical conditions on the one hand and biological conditions on the other influences the occupations, transportation, mode of life, and other activities of all human beings, no matter where they live." The several parts deal with the scope of economic geography, the vegetational factor, the soil and its use, problems of relief and erosion, the geography of high productivity, economic geography of animals, the human factor, food and diet, regions of high productivity, the mineral factor, manufacturing, and cities and commerce.

FOODS—HUMAN NUTRITION

Nutrition and defense, A. F. MORGAN. (Univ. Calif.). (*Amer. Jour. Digest. Diseases*, 8 (1941), No. 5, pp. 156-160).—This discussion of the diet deficiencies of the Nation, causes for these deficiencies, and how possibly to remedy them indicates the desirability of long-time Federal and State planning of crops to meet these needs, including in the plan the choice of vitamin-rich varieties for

given food crops. The discussion also points to the losses of vitamins from natural food products due to a high degree of milling and refining and to losses due to canning and drying, to decreased vitamin intake associated with our tendency to decrease caloric intake, and to the possibilities of fortification of foods with synthetic vitamins (with a note as to the cost and dangers of such fortifications). Two types of fortification are suggested—one, "protective" or "restorative" as applied to devitaminized manufactured foods, and the other "positive," supplying to some one food vehicle an excess of all vitamins sufficient to guarantee coverage of the deficit from the rest of the diet. Examples of such fortification in the case of bread and milk are given, together with indication as to the manner of applying the system for milk in case of wartime emergency. It is pointed out that the cost of protective fortification should properly be borne by the manufacturer, whereas positive fortification should be financed and carried out as a public health measure.

[Food and nutrition studies of the Massachusetts Station] (*Massachusetts Sta. Bul.* 378 (1941), pp. 37-38, 75-78).—Included in this progress report are summaries of studies, several of which continue earlier work (E. S. R., 83, p. 843) by M. E. Freeman and W. S. Ritchie on chemical changes in the cooking of vegetables; by H. S. Mitchell and A. W. Wertz on vitamin requirements of older people; by Mitchell and G. M. Cook on the influence of certain diamino and dicarboxylic amino acids upon the cataractogenic action of galactose; by Cook and Mitchell on time factors in the development of galactose cataract; and by Mitchell and Wertz on the influence of different salt mixtures on the utilization of lactose.

Edible meat from two weights of roasters: Comparing yields from 43 to 47-pound and 48 to 54-pound classes of roasters, B. Lowe. (Iowa State Col.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 2, pp. 95-102).—The yield of edible meat (cooked weight basis) from 60 roasters of each of these two size classes was determined, their respective total weights being 225 and 249 lb. The birds, received on October 16, 1939, were immediately placed in storage at -20° F. and held until they were removed for defrosting, cooking being started on October 18 and completed November 23. There was little or no loss of weight of the roasters during storage and defrosting. The data are reported for individual birds in each box of 12, and are summarized by boxes and by size classes. The New York dressed weight (including heads and feet) averaged 1,867.4 gm. (4.116 lb.) for the heavier birds and 1,697.4 gm. (3.74 lb.) for the lighter birds. Drawn weights (feet, head, neck, viscera, including kidneys and lungs, and giblets removed) averaged 65.9 and 65.7 percent of the New York dressed weight for these two classes, respectively; neck weights 2.7 percent in each case; and giblets before cooking 6.6 and 6.7 percent for the two classes, respectively. Cooked weights of edible meat and of giblets averaged, respectively, 29.9 and 3.8 percent of the New York dressed weight for the heavier birds and 30.2 and 3.8 percent for the lighter birds. It is pointed out that the cost per pound of edible meat would depend on the prices paid per pound for the dressed birds (in this case 22 and 21 ct. for the heavier and lighter birds, respectively), and amounted to 65.6 and 61.9 ct. per pound of cooked meat.

Storage of cured pork (*Mississippi Sta. Rpt.* 1940, p. 9).—A brief progress report on the study of the problem of home storage of hams and bacons indicates that these products kept better, showing less mold and a more desirable flavor, when stored in an ordinary farm smokehouse than when stored in a cooler at 48°-52° F. or in an indoor room on the first floor of a two-story brick building. Hams stored in the smokehouse were of high quality at the end of 6 mo., but bacons were of poor quality after only 3 mo. of storage.

Both hams and bacons were of higher quality if stored unwrapped or otherwise treated than if wrapped in brown paper, muslin, cornhusks, or sawdust, or scrubbed with whitewash paste.

Relationships between certain physical measurements upon fresh and stored eggs and their behavior in the preparation and baking of cake, W. E. PYKE and G. JOHNSON. (Colo. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 2, pp. 125-138, figs. 8).—Eggs, either fresh or after storage for 10, 20, or 30 days, at 22°-23° C. were used in whole-egg butter type and whole-egg sponge cakes. The cakes of each type were mixed and baked by standard procedures under definite conditions, the experiments being carried out in a high altitude laboratory. In the first experiments fresh eggs from various hens were broken until enough egg material of a single measurement classification had been assembled for the cake formula. The batter was then prepared and three cakes were baked. A similar series of experiments was run with eggs of initial high quality but allowed to deteriorate in storage. Graphs obtained by plotting the mean height of the firm white of the egg samples against mean volume or mean tensile strength of the cakes and analysis of variance of cake quality characteristics of eggs showed that a highly significant positive relationship existed between the volume and tensile strength of cakes and the quality of the eggs from which they were made.

In other experiments eggs from individual hens were used, these having been assembled over a period of a few days, with storage in a mechanical refrigerator until used, at which time all eggs embracing a particular sample were placed at room temperature simultaneously. Graphs presented to show the various relationships between egg quality measurements and the cake quality measurements and statistical treatment of the data covering these measurements indicated that length of storage period, percentage of initial weight of the eggs, height of firm albumen, and yolk index were all measures which might serve as an indicator of quality in eggs to be used in cake preparation. Length of storage period was negatively correlated with cake volume and tensile strength, while the other egg qualities were positively correlated.

Eggs of individual hens were found to differ significantly in their ability to yield high volume and tensile strength in cakes. This character of fresh eggs from individual hens persisted throughout the storage periods investigated. In many respects the effect of deterioration in the quality of the eggs was found comparable in these cake baking tests to the effect of a rise in altitude. Cake formula adjustments for altitude were effective in correcting for variations in egg quality. A method for estimating the relative quality of eggs by means of cake baking tests was developed which involved comparison of cake quality (as indicated by specific gravity) of cakes made with poor quality eggs and adjusted formula giving batter of noted specific gravity with the cake quality that would have been obtained from batter of the same specific gravity if good quality eggs had been used. Studies on frozen eggs indicated that they could be easily separated into quality grades on the basis of their performance in cake baking tests. Pullet eggs were found to be of very high quality, and it is suggested that these might well be frozen and handled separately by the industry.

Relation of mixing methods and a balanced formula to quality and economy in high-sugar-ratio cakes, W. E. PYKE and G. JOHNSON. [Colo. Expt. Sta.]. (*Bakers Digest*, 15 (1940), No. 4, p. 65).—This is a summary of a study reported earlier in greater detail (E. S. R., 84, p. 414).

Bacteriological studies of fresh crabmeat, L. C. TOBIN and C. S. McCLESKEY. (La. State Univ.). (*Food Res.*, 6 (1941), No. 2, pp. 157-167).—All coliform

organisms associated with crabs were found to be destroyed by adequate steaming preliminary to picking the meat. The presence of such organisms in the meat as it left the plant was evidence of contamination in handling. In the plant studied the three main sources of *Escherichia coli* in crab meat were the hands of employees, the dipping brine, and the ice used for cooling the brine and icing the barrels of meat. It was found possible to destroy coliform organisms in packaged crab meat by a pasteurization process described. This process did not adversely affect the texture and flavor of the meat, but had the advantage of greatly improving the keeping quality.

The suitability of different varieties of vegetables for sharp freezing. D. KNOWLES and O. GROTTODDEN (*North Dakota Sta. Bimo. Bul.*, 3 (1941), Vo. 6, pp. 20-23).—This progress report (E. S. R., 83, p. 560) lists those varieties of vegetables which were found to be suitable from the standpoint of yield, under North Dakota growing conditions, and of adaptability to freezing. Of the nine varieties of peas tested, Laxton Progress, Thomas Laxton, and Little Marvel were the best, the first two having also been tested in 1939 and found to be of good yield and of outstanding color and flavor. Jackson Wonder lima beans tested for a second year and Early Baby Potato, Baby Potato, and Henderson Bush, tested for the first time, yielded excellently and were all adapted to freezing. Of the five varieties of green beans, Green Pod Stringless, Dwarf Horticultural, Plentiful, and Bountiful all proved satisfactory again in the 1940 trials. Webber Wax, Topnotch Golden Wax, and Sure Crop Stringless, the latter tested in 1940 only, proved satisfactory out of the four varieties of wax beans tested. Kingscrot, Hiawatha, Golden Bantam, Sencross, Sachem, Golden Gem, Early Bancross, Tendergold, and Ioana of the 17 varieties of sweet corn tested were all suitable for freezing, although some varieties, particularly the first 3, were better than others. All corn varieties were of better quality when frozen off the cob rather than on the cob. It was also found that white corn did not hold up as well in freezing storage as yellow corn.

Procedure outlined for freezing fruits and vegetables: Varieties recommended. A. M. BINKLEY (*Colo. Farm Bul. [Colorado Sta.]*, 3 (1941), No. 3, pp. 10-12).—This general survey outlines briefly the factors that must be considered in the selection and preparation of fruits and vegetables for freezing and in the actual freezing, and cautions that all frozen vegetables, since they are not sterile, should be cooked before eating and never tasted until thoroughly cooked, should be cooked promptly after thawing, and should not be refrozen once thawed. Varietal recommendations and suggested procedures for several fruits are credited to the New York and North Dakota Stations, respectively.

Freezing your winter's supply of fruits and vegetables. C. W. DuBois (*Farm Res. [New York State Sta.]*, 7 (1941), No. 3, pp. 8-9, fig. 1).—This article discusses precautions to insure a high-quality product of good flavor and color. The following varieties of fruits are listed as the most satisfactory for freezing: Cherries (sour), Montmorency, English Morello, and the Dukes, (sweet) Bing, Napoleon, and Windsor; peaches, Halehaven, South Haven, J. H. Hale, Elberta, Veteran, Vedette, and Marigold (white varieties in general are not satisfactory) raspberries, (purple) Sodus and Columbian, (red) Cuthbert, Viking, Taylor, Marcy, and Indian Summer, (black) Bristol; and strawberries, Culver, Catskill, New Jersey 225, Marshall, and Blakemore. More detailed information has been given in Bulletin 690 (E. S. R., 83, p. 701).

Correlation of subjective scoring with sugar content of frozen peas. E. L. BLANCHARD and M. L. MAXWELL (Univ. Calif. and U. S. D. A.). (*Food Res.*, 6 (1941), No. 2, pp. 105-115, figs. 2).—A score card for judging cooked frozen peas is presented. This was developed on the basis of considerations

noted in detail and involving maximum scores of 40, 30, 30, 15, 10, and 5 for flavor, texture, appearance, color, size, and form, respectively, as judged upon tasting only the soft peas in the sample, and a final deduction amounting to one-third of the percentage of hard peas as counted in the sample. "The scores obtained were compared with the sugar content of numerous samples of different varieties of peas at different stages of maturity. Coefficients of correlation 0.73 and 0.74 between the sugar content and the subjective scores obtained on two groups of peas indicate that the score card and the sugar content are equally related to maturity. Variation in trend in the sugar content and scores on successive days of picking indicated that the edible quality of frozen peas may be affected by changes in the freezing procedure as well as by maturity."

Result of a demonstration sale of cherry cocktail, D. K. TRESSLER and C. S. PEDERSON. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 7, pp. 195-197, fig. 1).—Trial sales of a new fruit beverage, a "cherry cocktail," were conducted at six stores (regular and supermarket types), one in each of six towns in New York. From the volume of sales of the unadvertised product and from the consumer replies to a questionnaire, it appeared that the product was favorably received and that it might serve as an additional commercial outlet for cherries. The final blend of juices in the cocktail consisted of 28.1 and 9.4 percent, respectively, of cold- and hot-pressed Montmorency juice, 9.4 and 3.1 percent of cold- and hot-pressed English Morello juice, and 50 percent of 15-percent sugar sirup.

Nutritional requirements during the latter half of life, C. M. McCAY, L. A. MAYNARD, G. SPFFELING, and H. S. OSGOOD. (Cornell Univ.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 45-60, fig. 1).—This extension of an investigation of the nutritional problems of aging (E. S. R., 81, p. 689) deals with the effect after middle age of the level of intake and quality of the protein of the diet, as well as of exercise and restriction of body fatness, on the life span and organ weights of white rats. Through various combinations some of the comparisons were made on groups of 20 rats each, while for others it was possible to combine small groups into large ones containing as many as 164 individuals.

The combination of factors proving most favorable for longevity was a low-protein diet with liver as the source of protein, prevention of overfattening by restriction of the diet, and exercise. On a high-protein diet the non-exercised animals did better than the exercised. The favorable zone of body weight for the animals in the colony studied was between 350 and 450 gm. Three individuals attained ages exceeding 1,000 days. At the higher levels of protein intake the nonprotein nitrogen of the blood increased, and the heart and kidneys became larger. The albumin of the urine varied widely, but was roughly correlated with the protein level. It is noted in conclusion that "inasmuch as the major disease that afflicts rats during the latter half of life is one that involves the lungs, it is questionable whether the effects of high protein intake on rats are comparable to those on man."

Food consumption in the rural area of Puerto Rico [trans. title], S. DIAZ PACHECO (*Puerto Rico Univ. Sta. Bul.* 57 (1941), *Span. ed.*, pp. [2]+23, figs. 2; *Eng. abs.*, pp. 14-15).—This report, based on food consumption records of 439 selected rural families, is concerned with a survey similar to one reported earlier for city and village families (E. S. R., 84, p. 124). The families studied were distributed in the four agricultural areas that produce the major portion of the Island's crops of sugarcane, tobacco, coffee, and general produce, and represented 8.3 percent of the total number of families in these areas. The number of persons per family averaged 6.4, and the average annual income was \$276 per

family. The total annual food bill of these families amounted to \$91,120, of which 21 percent was represented by foods raised on the farm. The yearly consumption of fresh milk averaged but 43½ qt. per capita, 80 percent of this coming from cows kept by the families studied and 20 percent being obtained from neighboring farmers. Evaporated milk was used to the extent of only 1¼ lb. per person per year. The yearly per capita consumption of eggs averaged 49 and of beef, pork, and chicken 2.4, 3.5, and 3.6 lb., respectively. Ninety percent of the eggs and practically all of the chickens consumed were from fowls kept by the families. Codfish was consumed to the extent of 19 lb. per capita yearly, but fresh fish consumption was very low (about 1 lb.), due to the marketing system (chiefly by peddler) and the lack of refrigeration. Cereal consumption was quite high, rice leading with a yearly per capita consumption of 146 lb., followed by bread 20, corn meal 19, wheat flour 3½, and oatmeal 1 lb. Of the fats, the average yearly per capita consumption of lard and bacon amounted to 18 and 9 lb., respectively, and of oleomargarine and butter to but 6 and 1 oz., respectively. The consumption of green and leafy vegetables (peppers, lettuce, cabbage, and tomatoes) was very low, the amounts of these and of such starchy vegetables as plantains, potatoes, and yautias being lower than those consumed in urban areas where incomes were higher and marketing facilities better. The rural families studied raised about 42 percent of their consumption of sweetpotatoes and cassava and used these in larger quantities than did the urban families. It is pointed out that milk, eggs, fresh fish, and meat found appreciably greater use among the families studied in the urban survey than among the rural families. These latter consumed meat, milk, and vegetables other than sweetpotatoes and green bananas in proportion to the family income. When the effect of income was disregarded, it was observed that areas with larger production and lower retail prices enjoyed a higher consumption of the products they raised.

Food consumption studies in Puerto Rico, S. L. DESCARTES, S. DIAZ PACHECO, and J. R. NOGUERA (*Puerto Rico Univ. Sta. Bul.* 59 (1941), pp. [2] + 76, figs. 8).—This bulletin brings together material from previous studies (including those noted above) on food consumption and food supply (E. S. R., 84, p. 833), integrates the information to give a more comprehensive picture of food consumption on the Island, interprets the facts, and makes certain recommendations on the basis of the findings. In general there was no regular decrease in the amount consumed of any food in response to rising income. The protective foods showed the most consistent and pronounced increases in direct association with income, and to a lesser extent with education of the housewife. The largest deficiencies in comparison with dietary standards were in those expensive foods rich in animal proteins, particularly eggs and dairy products. It is concluded that dietary improvement in Puerto Rico is principally dependent upon increases in income, particularly among the very poor. It is recommended that the most effective way to increase food consumption and ameliorate the dietary deficiencies is to increase the income of the people, especially the very poor; that there should be thought and research as to better utilization of the meager expenditures for foods that poor people can afford; and that there should be an educational program on nutrition, emphasizing (1) the need and desirability for vegetable gardens in the rural area, (2) the functions and need of protective foods in the diet, and (3) instructions on the nutritional merits of locally grown starchy vegetables.

Flavor and the factors governing it, F. W. FABIAN. (Mich. State Col.). (*Bakers Digest*, 15 (1940), No. 4, pp. 63-64, 67-68).—Essentially noted from another source (E. S. R., 85, p. 126).

A study of the sensitiveness of prospective food judges to the primary tastes, D. KNOWLES and P. E. JOHNSON. (N. Dak. Expt. Sta.). (*Food Res.*, 6 (1941), No. 2, pp. 207-216).—Taste thresholds for sodium chloride, sucrose, tartaric acid, glutamic acid, and caffeine were determined in a group composed of 18 women and 19 men. Not all the individuals were able to identify the sweet taste, or the bitter taste, or to discriminate between salt and sweet or bitter and sweet. Twelve individuals, of whom 3 were considered fair, 4 good, and 5 excellent on the basis of their minimum thresholds and their ability to discriminate between tastes, showed the following range of concentrations from lowest to highest threshold of taste for the solutions in the above order, respectively: 0.001-0.08 M, 0.003-0.05, 0.00012-0.003, 0.0001-0.003, and 0.0002-0.005 M. Although the number of people tested is small, the results are considered to indicate that there is probably no correlation between the ability to identify the primary tastes and age, experience in judging, and smoking.

The influence of certain fruit juices on gastric function, H. W. HAGGARD and L. A. GREENBERG (*Amer. Jour. Digest. Diseases*, 8 (1941), No. 5, pp. 163-170, figs. 9).—The influence of canned grape, grapefruit, orange, pineapple, prune, and tomato juices on gastric acidity, peptic activity, and emptying time of the stomach was studied, employing three different test meals. pH determinations showed that acids of the fruit juice directly influenced the pH of the gastric juice during the early part of digestion, but had no appreciable influence at the height of digestion. With pineapple juice the minimum pH was reached in shorter time than after the other fruit juices, and the subsequent rise of pH was more marked. None of the fruit juices exhibited any proteolytic activity, and none seriously retarded peptic activity. The latter was stimulated by pineapple juice. After a carbohydrate meal, the emptying time of the stomach was found to be delayed slightly by all of the fruit juices, probably due to increase in size of the meal. After meals containing glycocoll or protein, there was no marked reduction in emptying time except with pineapple juice. This effect is interpreted not as due to direct action of the fruit juice on the stomach, but only to more rapid preparation of the food for discharge from the stomach.

The effect of feeding apple sauce on induced diarrhea in rats, Z. I. KEETESZ, M. S. WALKER, and C. M. MCCAY. (N. Y. State Expt. Sta. coop. Cornell Univ.). (*Amer. Jour. Digest. Diseases*, 8 (1941), No. 4, pp. 124-128).—Diarrhea was induced in young rats by the daily feeding of 10 cc. of milk containing 1 gm. of lactose. When rats 3 weeks old (corresponding to 2 yr. in a child) were fed this mixture as the sole diet, diarrhea developed in a few days in about half of the animals and usually lasted about 10 days without treatment. After the diarrhea had persisted for 3 days, groups of the animals were fed as supplements to the milk diet one of four apple preparations—(1) a commercial canned applesauce manufactured for infant feeding, (2) the same sauce in which the pectins had been completely hydrolyzed by the addition of a highly active commercial pectinase, (3) a preparation of the pectins of the original sauce obtained by successive hot water extractions, and (4) the residue from (3). Preparations (1) and (3) contained pectins, calculated as calcium pectate, amounting to 0.57 and 0.45 percent, and preparations (2) and (4) no pectins. Crude fiber amounted to 0.55 percent in preparations (1), (2), and (4) and was absent in (3). The relative viscosities of the water extracts of the materials were (1) 3.69, (2) 1.04, (3) 2.12, and (4) 1.00, and the pH values 3.20, 3.07, 4.28, and 4.41, respectively. The applesauce was fed in 10-gm. amounts daily, and the other preparations in equivalent amounts. In groups of from 16 to 34 animals on each treatment the efficiency of the curative diets, expressed as percentages of cures (two partial

cures being reckoned as one complete cure), were 84, 39, 23, and 53 percent, respectively.

Comparing the relative effectiveness of the apple preparations with the treatment given the original applesauce, the authors conclude that while pectins played an important role in the therapeutic action, the fibrous materials of the apple also contributed to the curative action. "There was no indication that the presence of uronic acids had any role in curing the induced diarrhea in rats."

Anemia from lysine deficiency in deaminized casein. A. G. HOGAN, E. L. POWELL, and R. E. GUERRANT. (Mo. Expt. Sta.). (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 41-49, figs. 3).—Earlier work (E. S. R., 81, p. 884) having given negative results in establishing an amino acid deficiency as in part at least responsible for the anemia developing in rats fed deaminized casein rations, the study was continued, using larger amounts of amino acids. Rats brought to an anemic state by rearing on a milk diet were placed on a deaminized casein-wheat gluten ration, the negative controls receiving this diet only, the test groups receiving supplements of lysine, histidine, arginine, and methionine in various combinations and at various levels, and the positive controls receiving casein in place of the protein mixture. Each of the amino acid combinations improved the basic diet materially, as judged by increase in weight and in red cell count, but the mixtures of amino acids did not cure the anemia any more promptly than lysine alone. In further tests, in which food intakes were balanced, a deaminized casein ration with 4 percent δ -lysine as the only supplement was compared with the casein ration. Growth response and recovery from anemia indicated that except for lysine deaminized casein is not grossly deficient in any essential amino acid. Recovery from the anemia with 4 percent δ -lysine was more rapid than with 2 percent. There was no growth on the latter level, but the former permitted growth at a suboptimal level. Interpretation of earlier data concerning the antianemic activity of various proteins is attempted in the light of these findings concerning lysine. The importance of suitable dietary protein in relation to recovery from anemia and the probable importance of lysine in erythropoiesis are emphasized.

The role of wheat minerals in nutrition. J. E. GREAVES. (Utah Expt. Sta.). (*Northwest. Miller*, 202 (1940), No. 8, pp. 2-3, 6, 9, 38, 40, 45).—Noted from another source (E. S. R., 83, p. 273).

Effect of calcium and phosphorus on retention of lead by growing organism. L. G. LEDERER and F. C. BING (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 25, pp. 2457-2461, figs. 2).—Rats, fed for 1 week after weaning on the Sherman diet B, were divided into groups and transferred to a basal diet composed of 79 percent yellow corn meal, 20 percent wheat gluten flour, and 1 percent NaCl. Basic lead acetate to the extent of 100 mg. of lead per kilogram of ration was added to the diet in all but two experimental groups, and calcium carbonate and potassium phosphate or both were added to the diets in amounts to give from 0.12 to 2.0 percent of calcium and from 0.12 to 1.0 percent of phosphorus, with calcium:phosphorus ratios varying from 0.25 to 4.0 in the several groups. After 3 weeks of ad libitum consumption of these diets, certain of the tissues were analyzed for lead. The results indicated that the amount of lead stored in the body was diminished by the addition of calcium carbonate to the diet. The addition of phosphate had no significant effect. Lead was stored chiefly in the bones, and the kidneys contained relatively high concentrations of the element as compared with liver. The beneficial effect of the calcium appeared to be due to the prevention of absorption of lead from the intestinal tract, since dietary calcium had no significant effect on the retention of lead administered to a number of animals by injection into the abdominal cavity.

Boron in feeds and food (*Kentucky Sta. Rpt. 1940, pt. 1, p. 31*).—In continuation of the study of boron in plant materials (E. S. R., 83, p. 436), further analyses were made of various plants, including corn, wheat, oats, rye, and barley; grasses used for hay and pasture; legumes; potatoes, sweetpotatoes, milk, and eggs; carrots, lettuce, spinach, kale, celery, dried beans, peas, peaches, oranges, figs, dates, prunes, raisins, apricots, and the kernels of nuts; mature leaves of forest trees; leaves of Burley tobacco; and a sample of kelp from the Pacific coast.

Metabolism of free citric acid in the rat, C. A. KURTHER, C. E. MEYER, and A. H. SMITH (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 224-226).—Citric acid metabolism experiments in rats are reported, with the conclusion that "citric acid administered to the rat is absorbed, since no extra citric acid appears in the feces and intestinal contents do not destroy it. The albino rat has the ability to completely metabolize maximum nonfatal quantities of free citric acid."

The stabilization and determination of pyruvic acid in the blood, E. BUEDING and H. WORTIS (*Jour. Biol. Chem.*, 133 (1940), No. 2, pp. 585-591).—A modification of the method of Lu (E. S. R., 82, p. 587) for determining the pyruvic acid content of the blood is described in which moniodoacetic acid is added to stabilize the pyruvic acid, larger amounts of blood are used to lessen the errors in colorimetric reading, the dinitrophenylhydrazone of the pyruvic acid, together with the free hydrazine, is extracted first with 4 cc. and then twice with 2 cc. of ethyl acetate, and 2 N instead of N sodium hydroxide is added to the sodium carbonate extract. The color developed under these conditions is said to be more stable, and no interference of other keto acids was observed in the blood of normal subjects.

The content of pyruvic acid determined by this method on 60 normal subjects from 8 to 48 yr. of age, with 24 under the age of 15, ranged from 0.77 to 1.16 mg. percent, with an average of 0.98 mg. percent and a standard deviation of ± 0.09 . The addition of sodium cyanide to 2 samples of blood caused a greater disappearance of pyruvic acid than would occur in the same length of time without this addition, and this was not prevented by the presence of iodoacetate. In similar tests with fluoride, the fluoride alone did not prevent the disappearance of pyruvic acid from blood samples standing at room temperature, but fluoride and sodium iodoacetate together stabilized the pyruvic acid.

Pyruvic acid in blood and cerebrospinal fluid, E. BUEDING and H. WORTIS (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 245-248).—Samples of blood and cerebrospinal fluid were obtained simultaneously from 67 patients with various neuropsychiatric and medical disorders and analyzed for pyruvic acid by the method noted above, with the exception that the addition of the stabilizing medium was found unnecessary with the cerebrospinal fluid. Values under 1.30 mg. percent, arbitrarily selected on the basis of the above study as the upper limit of normal, were obtained for 51 of the subjects. The minimum, maximum, and average values for these subjects were 0.79, 1.30, and 1.03 mg. per 100 cc. Corresponding spinal fluid values were 0.42, 1.52, and 0.84 mg. per 100 cc., respectively. The blood values for the remaining 16 patients ranged from 1.41 to 2.41, with an average of 1.82, and for the cerebrospinal fluid from 1.03 to 2.40, with an average of 1.77 mg. per 100 cc. Among the cases with high pyruvic acid levels there were 13 with clinical syndromes known to be the result of vitamin B₁ deficiency. It is suggested that in the other 3 cases a relative deficiency of vitamin B₁ may have existed as a result of increased metabolism because of prolonged fever. In none of the cases, however, was there any evidence of acute peripheral neuropathy.

Enzymatic hydrolysis of d-peptides, J. BERGER, M. J. JOHNSON, and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 137 (1941), No. 1, pp. 389-395, fig. 1).—The studies described gave evidence that previous theories of the optical specificity of certain peptidases cannot be assumed to be applicable to all types of peptidases, and that the presence of d-peptidases is not characteristic of tumor growth. Thus, serums from rats with Flexner-Jobling carcinoma and from humans with gastric cancer were unable to hydrolyze d-leucyl peptides at any appreciable rate, but were able to split dl-leucyl peptides. Significant amounts of d-peptidases could not be artificially produced in rat or mouse serum by repeated injection of dl-leucylglycine. "Peptidases from chick mucosa, yeast autolysate, and malt are able to split d-leucylglycine about one-thirtieth as rapidly as dl-leucylglycine in the presence of suitable activators such as Mn or Mn-cysteine. Peptidases from *Leuconostoc mesenteroides* and *Clostridium butylicum* are able to hydrolyze d-leucyldiglycine at least one-fifth to one-half as rapidly as dl-leucyldiglycine. Peptidases from *Bacillus megatherium* and *Pseudomonas fluorescens* hydrolyze dl-leucylglycine only 2 to 16 times as fast as d-leucylglycine."

The effect of high pressure treatment on the physiological activity of insulin, R. B. DOW, J. E. MATTHEWS, JR., and W. T. S. THORP. (Pa. State Col.). (*Amer. Jour. Physiol.*, 131 (1940), No. 2, pp. 382-387).—The physiological activities of normal insulin and of the corresponding product as pressure treated by the method outlined were measured by the percentage lowering of blood sugar in rabbits that were given standard doses, or the equivalent of the pressure-treated product. The evidence indicated that the physiological activity of insulin is unaffected by long exposure to pressure of the magnitude of 10,000 kg. per square centimeter. Pressure produced denaturation as evidenced by the coagulation of the insulin, but this coagulation did not affect the physiological activity. The absence of any change in amino nitrogen content of the insulin was interpreted to mean that the pressure did not produce hydrolysis under the experimental conditions used. "It is suggested that the results of these experiments indicate that the physiological activity of insulin is associated with its polypeptide or amino acid linkages, rather than with any particular bonding or grouping of the chains such as might exist in the undenatured state of the molecule."

[Nutrition studies by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1940], pp. 53-55).—Progress is reported on a continuation of studies (E. S. R., 84, p. 122) on the nutritional status of college women with respect to vitamin C and on vitamin A metabolism in human subjects as determined by rhodometer tests.

Retention of vitamins C and A in glass-packed foods, C. R. FELLERS and R. E. BUCK. (Mass. Expt. Sta.). (*Food Res.*, 6 (1941), No. 2, pp. 135-141).—Large experimental cannery packs of tomato juice, puréed peas (three varieties), and spinach were packed mainly in flint jars, although some tomato juice was also packed in amber glass. These products, sealed and processed by commercial procedures and stored (1) at 35°-40° F. in the dark, (2) at 70°-80° in the dark and (3) in the light, and (4) at 92° in the dark, were analyzed for their content of vitamins A and C immediately after canning and at stated intervals up to 400 days. Strained carrots were also included in the study of vitamin A losses.

The degree of retention of vitamin C was similar in the several products, the loss amounting to only 10-25 percent after storage for 1 yr. at room temperature (70°-80°). Most of this loss occurred within the first 2 or 3 mo. of storage. At a storage temperature of 36° less than 5 percent of the vitamin C was lost within the year, while at 90° the average loss approximated 21 percent. Storage in the

light hastened the reduction in the vitamin C content of glass-packed foods, but did not affect the total loss. About 85 percent of the original vitamin A (carotene) content of the glass-packed strained spinach, carrots, peas, and tomato juice was retained after storage in subdued light for 1 yr. The amber glass had some protective value in retaining the vitamin A content of tomato juice. Products stored at 36° were superior in color and flavor to those held at 70° or 90°. The bottled tomato juice was still of good flavor and color after more than a year's storage close to west windows.

Observations on carotene analysis of vegetables and fruits as a basis for prediction of their vitamin A value, M. C. SMITH and L. OTIS. (Univ. Ariz.). (*Food Res.*, 6 (1941), No. 2, pp. 143-150).—The reliability of carotene analyses as a means of predicting the vitamin A value of plant foods was studied in the case of a number of green and yellow fruits and vegetables which were analyzed for carotene content and were fed in equivalent carotene quantities to vitamin A-depleted rats. As judged by vitamin A storage in the liver of these animals, the different plant sources (apricots, asparagus, broccoli, carrots, endive, pumpkin, spinach, water cress, and yams) varied widely in the efficiency of utilization of their carotene and were all less effective than pure β -carotene in bringing about liver storage of vitamin A. The yellow foods were especially inefficient in promoting vitamin A reserves in proportion to their carotene content. Growth response, as measured by the Sherman bioassay technic in the feeding of spinach, pumpkin, and carrot, was likewise not in accord with the expected response, as judged from the carotene value of the plant material. In the case of carrots deeply pigmented samples containing 140 μ g. per gram were found to have little more than twice the vitamin A value of pale orange carrots containing but 12 μ g. per gram. It is considered that this observed discrepancy may be partially explained by variations and errors in sampling, which are difficult to avoid in the 8-week test period. Analyses of many samples of carrots showed variations in carotene content associated with color, length, age, portion of root sampled, and time of storage in the range of 7-170 μ g. per gram.

The effect of treated fats on vitamin A potency, II, H. C. DYME, P. M. NELSON, B. LOWE, and V. E. NELSON. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 15 (1941), No. 2, pp. 189-212).—In continuation of the study (E. S. R., 83, p. 131), the effect of treated fats on the vitamin A potency of butterfat and cod-liver oil was observed. Various fats were used, and the treatments included heating, autoclaving, and mixing with norite or fuller's earth or with antioxidants. The summary of results indicated that most of the heated fats inactivated butterfat, but only oils with iodine numbers corresponding to those of drying or semidrying oils, upon being heated, inactivated cod-liver oil as well as butterfat.

"The vitamin A activity of cod-liver oil was found to be far more resistant to the destructive action of heated fats but much more easily destroyed by finely divided solids than was the vitamin A activity of butterfat. The saturated fatty acids, stearic and palmitic, and the glycerol portion of fat were not responsible for the inactivating potency of heated fats. The unsaturated fatty acids, for example, oleic, linoleic, and linolenic, were involved in the response of fats to heat. . . . The vitamin-A-inactivating power of heated fats was not produced by heat alone, but by the combined action of heat and oxygen. Heat acted mainly to accelerate the action of oxygen. Autoclaved lard, most of the stored fats, and aerated fats did not destroy vitamin A activity. . . . Antioxidants varied in their efficacy with the fat employed; thymol was an excellent antioxidant with lard, but did not possess antioxidant properties with Mazola

or soybean oil. Antioxygens preserved the induction period and were ineffective if added after the termination of this period. Their activity diminished as oxidative conditions were intensified. Baking did not destroy the vitamin A activity of butter in cookies. This was true whether the cookies contained butter as the only fat or butter and some other fat such as lard, Clix, or Crisco. . . . Some aerated fats and some stored fats were toxic when injected intraperitoneally; others were not. . . . Although heated Mazola and heated ethyl oleate were definitely toxic when injected intraperitoneally, they proved only slightly injurious when introduced by way of stomach tube. Heated Mazola was not regenerated by agitation with fuller's earth or by steam distillation. Semicarbazide hydrochloride detoxified heated fats, but failed to reduce their inactivating properties. The toxic substances are either aldehydes or ketones, while the substances responsible for the inactivation are neither aldehydic nor ketonic."

Dark adaptation in healthy, well-nourished men [trans. title], R. PIES and H. WENDT (*Klin. Wchnschr.*, 19 (1940), No. 18, pp. 419-420, fig. 1).—Dark adaptation curves were obtained with the Engelking-Hartung adaptometer for 100 healthy persons and correlated with vitamin A determinations in the blood serum and vitamin A saturation tests with the concentrate Vogan to determine which of the adaptation curves might be considered normal and which to indicate a vitamin A deficiency. In this way limits between normal and pathological dark adaptation values were established for use in detecting vitamin A deficiency.

Vitamins and senescence, A. F. MORGAN. (Univ. Calif.). (*Sci. Mo.*, 52 (1941), No. 5, pp. 416-421, figs. 4).—This is a nontechnical discussion, illustrated by rat photographs, of the author's discovery and further research on the anti-graying factor (or factors) of the vitamin B complex (*E. S. R.*, 85, p. 276), and the possible bearing of the findings on the prevention of premature senescence.

Nutrition [studies by the Idaho Station] (*Idaho Sta. Bul.* 239 (1941), pp. 59-60).—This progress report (*E. S. R.*, 84, p. 412) summarizes an extension of studies by E. Woods on the ascorbic acid metabolism of college men and the vitamin B complex factors in Russet Burbank potatoes.

Vitamins in peanuts and some of their products, with special reference to vitamin B₁ and the pellagra-preventative factor, T. A. PICKETT (*Georgia Sta. Cir.* 198 (1941), pp. 10).—This publication gives a general survey of the nutritive value of peanuts and peanut byproducts, and discusses in general their vitamin B₁ and nicotinic acid contents. The material, presented in popular form, is based on the technical findings presented in Georgia Station Bulletin 213 noted on pages 725, 728, and 757. The findings are summarized as follows:

"Besides the fact that peanuts are a very valuable food because of their high protein and oil content, they are an excellent source of at least three and probably more components of the vitamin B complex—vitamin B₁ or thiamin chloride, riboflavin, and the pellagra-preventive factor or nicotinic acid. Although heat treatment during processing results in some loss of vitamin B₁, the resulting products—meal, flour, roasted peanuts, and peanut butters—are still fairly high in this vitamin. Solvent-extracted peanut meals are about twice as rich in vitamin B₁ and pellagra-preventive factor as raw peanuts. Peanut skins are an excellent natural source of vitamin B₁. Heat treatments during processing of peanuts resulted in no appreciable losses of the pellagra-preventive factor in the resulting products tested."

Interrelationship between the vitamin B complex and the anterior lobe of the pituitary gland, D. C. SUTTON and J. ASHWORTH (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 11, pp. 1188-1192, pl. 1).—Evidence is presented in four case reports indicating the cure with an extract of the anterior lobe of the

pituitary gland of pellagra lesions which had failed to respond to nicotinic acid, riboflavin, liver extract administered parenterally, and an adequate diet. A fifth patient was given the glandular treatment without preliminary vitamin treatment. In this case, as in the others, the treatment was followed by recovery of the pellagra lesions. It is suggested that vitamin deficiency or partial starvation may cause a decrease of the hormones of the anterior lobe of the pituitary, and that this would serve to explain the results with all of the subjects except the one in whom recovery occurred in spite of the low vitamin diet.

Relation of skin lesions in the rat to deficiency in the diet of different B₂-vitamins. H. CHICK, T. F. MACRAE, and A. N. WORDEN (*Biochem. Jour.*, 34 (1940), No. 4, pp. 580-594, pl. 1, figs. 3).—In an effort further to differentiate the skin lesions of rats resulting from deficiencies in the various vitamins of the B complex thus far designated in the authors' laboratory as "type A" and "type B" as described by Copping (*E. S. R.*, 76, p. 426), two series of experiments were run. In the first newly weaned rats were given a basal B complex-free diet supplemented with pure vitamin B₂ or with one of the three factors riboflavin, filtrate fraction, and eluate fraction (vitamin B₃), and after skin lesions had developed supplemented further with certain of the missing factors in curative tests. In the second series the basal diet with vitamin B₂ was first supplemented with at least two of the B₂ complex vitamins and later with certain of the others. The experiments, which were conducted over long periods up to 1 yr., led to the following differentiation of symptoms:

"Rats deprived of riboflavin showed no significant increase in weight and developed an eczematous condition of the skin affecting specially nostrils and eyes; the rims of the latter became denuded of hair; there was dullness of the cornea, blepharitis, and conjunctivitis, the eyelids being stuck together with a serous exudate. These symptoms cleared up rapidly when riboflavin was given. Rats deprived of filtrate fraction showed slow subnormal growth up to a maximum weight of about 100-130 gm. weight; they developed poor coats with matted and stringy fur which often became gray in the pigmented areas over the head and shoulders and was frequently stained with a reddish exudate containing protoporphyrin on the forearms and abdomen. Rats deprived of eluate fraction (vitamin B₃) developed characteristic dermatitis, which was cured promptly when pure vitamin B₃ was given. After prolonged deprivation the rats became hypersensitive and developed a tendency to fits of an epileptic nature." It is noted, however, that the relation of the skin lesions to the known missing vitamin was not always strictly specific. Dermatitis in rats deprived of both vitamin B₂ and riboflavin showed temporary improvement when riboflavin alone was given, and on prolonged deprivation of vitamin B₂ the lesions observed resembled those occurring in deficiency over shorter periods of time of riboflavin or of the filtrate fraction.

Occurrence of fits of an epileptiform nature in rats maintained for long periods on a diet deprived of vitamin B₃. H. CHICK, M. M. EL SADR, and A. N. WORDEN (*Biochem. Jour.*, 34 (1940), No. 4, pp. 595-600).—A further description is given of the epilepticlike fits noted above as occurring in rats after prolonged deprivation of vitamin B₃ and prevented and cured by the pure vitamin in amounts of 10-15 µg. daily. The nature of these seizures and the circumstances under which they develop are said to resemble closely those previously observed in pigs (*E. S. R.*, 82, p. 663).

An addendum by J. G. Greenfield summarizes the results of the histological examination of the tissues of the rats suffering from fits.

A study of the urinary excretion of vitamin B₂ by a colorimetric method. J. V. SCUDL, K. UNNA, and W. ANTROPOL (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp.

371-376, figs. 2).—Earlier studies on the rat (E. S. R., 84, p. 562) have been extended to the dog and man, following essentially the same plan of determining by a colorimetric procedure the vitamin B₆ content of the urine before and at definite periods after the administration of suitable test doses of the vitamin.

"After the intravenous administration of the vitamin in doses ranging from 25 to 500 mg., 18 percent of the vitamin was recovered from the urine of dogs within 1 hr. After oral administration, these dogs excreted 20 percent of the vitamin within 6 hr. In a group of apparently healthy human subjects, an average of 8.7 percent of a 50-mg. intravenous dose of the vitamin was recovered within 1 hr., while 7.6 percent of a 100-mg. oral dose was recovered within 4 hr."

The effect of diet on the pantothenic acid content of eggs, E. E. SNELL, E. ALINE, J. R. COUCH, and P. B. PEARSON. (Tex. Expt. Sta. et al.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 201-205).—Eggs from White Leghorn hens maintained from hatching on a diet deficient in pantothenic acid (0.44 mg. per 100 gm.) were found to contain, on an average, 0.41 and 9.66 μ g. of pantothenic acid per gram of white and yolk, respectively, as compared with averages of 0.76 and 46.3 μ g. per gram for whites and yolks of eggs from hens on the stock diet containing 1.9 mg. of pantothenic acid per 100 gm. Whole eggs (without shell) averaged 361 and 1,732 μ g. per 100 gm. for these two groups, respectively, as calculated on the basis of weight data for white and yolks. When the deficient diet was supplemented with 8.4 mg. of *dl*-sodium pantothenate per 100 gm. of feed there was a gradual increase in the pantothenic acid content of both yolks and whites of eggs from these same experimental hens. This increase, continuing for about 18 days, brought the pantothenic acid content to a stationary level more than twice that in eggs from hens on the stock diet. The ratios of the pantothenic acid contents of deficient, stock, and supplemented diets were 1:4.3:10.5, and those of the eggs from hens maintained on these diets were 1:4.8:9.8. It is concluded that within the limits tested the pantothenic acid content of the egg is directly proportional to that of the diet.

The distribution of pantothenic acid in certain products of natural origin, T. H. JUKES. (Univ. Calif.). (*Jour. Nutr.*, 21 (1941), No. 2, pp. 193-200).—The pantothenic acid content of 68 foods and other products of natural origin is reported, the range of values and the average for the number of assays specified being given on the basis of dried as well as undried material, and expressed as micrograms per gram. The values were determined by the author's chick assay procedure (E. S. R., 78, p. 231), using assay periods of 7, 9, or 14 days and the basal diet previously described (E. S. R., 82, p. 93), this being supplemented for the "positive control diet" with 6 mg. of synthetic (*dl*) pantothenic acid per 100 gm. Calculation of the pantothenic acid content of the food supplement was based on the previous finding that one chick "filtrate factor" unit corresponds to 14 μ g. of natural pantothenic acid.

The dietary requirement of the chick for thiamin, riboflavin, and pantothenic acid is compared with the varying distribution of these vitamins in certain foods.

Effect of cooking on riboflavin content of chicken meat, A. Z. HODSON. (Cornell Univ.). (*Food Res.*, 6 (1941), No. 2, pp. 175-178).—Thigh meat from Single Comb White Leghorn broilers averaging about 1 lb. in weight and previously fed a ration containing 690 μ g. of riboflavin per 100 gm. of feed was used in this study. Paired samples from right and left sides of the chickens were analyzed raw and in the cooked state, respectively, for their content of riboflavin, as determined by the method of Hodson and Norris (E. S. R., 83,

p. 151). Fried, broiled, roasted, and stewed samples, cooked by procedures noted, averaged 2.83, 3.15, 2.75, and 2.80 $\mu\text{g.}$ of riboflavin per gram of fresh cooked material as compared with 2.92, 3.04, 2.75, and 2.78 $\mu\text{g.}$ per gram for the corresponding raw samples. Fried and raw chicken liver averaged 26.80 and 26.50 $\mu\text{g.}$ per gram of fresh material. The analyses calculated to the dry matter basis also showed agreement between raw and cooked samples. Apparently, therefore, none of the cooking procedures used caused any measurable destruction of the riboflavin in chicken meat.

The ocular manifestations of ariboflavinosis: A progress note, V. P. SYDENSTRICKER, W. H. SEBRELL, H. M. OLECKLEY, and H. D. KRUSE. (Univ. Ga. et al.). (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 25, pp. 2437-2445, figs. 10).—The earlier observations of ocular symptoms on diets known to be deficient in riboflavin (*E. S. R.*, 84, p. 707) have been extended to a total of 47 subjects, of whom 16 were hospitalized for nutritional disease, including 11 with active pellagra or a history of typical pellagrous lesions within a year; 13 were outpatients, including 5 pellagrins in whom signs of ariboflavinosis developed during treatment with nicotinic acid; and 18 were institutional employees apparently well nourished, although 3 were on restricted diets. Of the third group all had shown two or more of the ocular symptoms described in the earlier paper, but 12 had no other symptoms of ariboflavinosis. Uncomplicated ariboflavinosis was induced in the hospitalized patients following the cure of pellagra with nicotinic acid by further supplementation of the diet with all other vitamins than riboflavin. The most frequent ocular symptoms observed were photophobia (43 cases), burning of the eyes (40), and dimness of vision not corrected by adjustment of refractive errors (29), and the earliest and most common signs circumcorneal injection, followed by conjunctivitis and corneal vascularization. Frank iritis was seen in 4 and cataract in 6 of the hospitalized cases and moderate congestion of the iris, with accumulation of pigment on its anterior surface, in 19 cases.

Following riboflavin treatment in doses of from 3 to 10 mg. daily, the functional symptoms were very promptly relieved, in some instances before visible changes occurred in the cornea. Diagrams are given showing the progress of corneal vascularization on the deficient diet and photographs of one subject during the progress and cure of severe ariboflavinosis. Several case reports are given in some detail.

Estimation of nicotinic acid in animal tissues, blood, and certain food-stuffs.—I, Method; II, Applications, E. KODICEK (*Biochem. Jour.*, 34 (1940), No. 5, pp. 712-725, figs. 8; pp. 724-735).—In the first of these two papers a critical study of the factors influencing the accuracy of the cyanogen-*p*-aminocetophenone method of estimating nicotinic acid, as described by Harris and Raymond (*E. S. R.*, 84, p. 274), is reported, and the specificity and sensitivity of the reaction are discussed. Of the various factors studied, the method of extraction proved of particular significance. It was found that while the entire chromogen could be as readily extracted from most animal tissues by boiling water as by hydrolysis with NaOH, only a small fraction of the chromogen from certain cereals could be extracted with boiling water. The author is of the opinion that this small fraction represents the true or active nicotinic acid in cereals. Concerning the specificity of the test, numerous amino acids and other substances unrelated to pyridine gave negative color tests, while of all the substances related to pyridine only nicotinic acid-*N*-diethylamide gave a measurable color at a concentration not greater than 20 $\mu\text{g.}$ in 15 cc. of the material. This substance was also the only one of the derivatives tested which was biologically active. In contrast to nicotinamide, which gave only 20 percent of its maximum color

if unhydrolyzed, nicotinic acid-*N*-diethylamide gave a more intense color without hydrolysis. As little as from 1 to 2 μ g. of nicotinic acid could be detected in 1 gm. of material. In control tests quantitative recovery of added nicotinic acid was effected.

In part 2 the working details of the procedure noted above for determining nicotinic acid are outlined, the technic followed with animal tissues is described fully, and data are reported and discussed on the nicotinic acid content as thus obtained of various animal tissues, milk and eggs, cereals, and a few vegetables and fruits. For certain animal tissues and medicinal preparations data are also reported for total nicotinic acid and for nicotinic acid in the unhydrolyzed and hydrolyzed alcohol-soluble fractions. The results for animal tissues in general ran parallel with their reputed biological or pellagra-preventing values. The unexpected finding was the very low concentration of nicotinic acid in milk, both cow's and human. Commenting on the latter finding, the author states, "this result raises questions about the metabolism of the growing organism. As infants need nicotinic acid for their coenzyme systems, it would be interesting to ascertain whether infants are born with a large store of nicotinic acid or have some means of synthesizing it." In blood, nicotinic acid was found only in the red cells and in a form precipitated completely by ethyl alcohol and acetone. It is considered probable that the total nicotinic acid in the blood is derived only from phosphopyridine nucleotides.

The stability of nicotinic acid was shown by practically identical figures obtained for the content of nicotinic acid in samples of a yeast preparation after storage for varying periods of time up to more than 3 yr. Urine preserved with sulfur-free toluene in a refrigerator showed no loss in nicotinic acid on the twenty-fifth day. The differentiation of various fractions of nicotinic acid, although only provisional, has led to the conclusion that little or no free nicotinic acid is present in living animal tissues, but that on autolysis it is rapidly set free from coenzymes or other combined forms.

Application to urine of Bandier and Hald's method for determination of nicotinic acid. L. A. ROSENBLUM and N. JOLLIFFE (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 137-141, figs. 2).—A slight modification of the Bandier and Hald method (E. S. R., 82, p. 586) was used in determinations of the content of nicotinic acid in urine and the recovery of added amounts. In 24 determinations on the 24-hr. urines of 13 apparently normal subjects (resident physicians) on a presumably adequate general diet, the nicotinic acid content ranged from 3.4 to 10.2 mg. Successive specimens from the same subject over from 2 to 7 days showed variations of as much as 100 percent in nicotinic acid content. An excretion of 2.8 mg. of nicotinic acid by a pellagrous patient on the first day of a control period on a diet deficient in pellagra-preventing foods was followed by a decrease to zero values. A change in the diet to one high in B vitamins was followed promptly by a rise in nicotinic acid excretion, and this was followed by a still greater increase when the diet was supplemented by 100 mg. of nicotinic acid daily.

Synthesis of factor V (pyridine nucleotides) from nicotinic acid in vitro by human erythrocytes. H. I. KOHN and J. R. KLEIN (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 685-689, fig. 1).—The conflicting evidence on the ability of erythrocytes to synthesize factor V (E. S. R., 83, p. 858) is reviewed and a reinvestigation of the problem is reported, with confirmation of the earlier conclusion that human erythrocytes can synthesize factor V from nicotinic acid. The inability of Vilter et al. to effect this synthesis is attributed to two factors—damage to the cells and lack of sensitivity of the method employed. Other factors tending to diminish the synthesis are the presence of oxalate,

the absence of glucose, and the suspension of the cells in sodium chloride solution.

Synthesis and excretion of trigonelline, H. P. SARETT, W. A. PERLZWEIG, and E. D. LEVY (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 483-485).—Two methods of synthesizing trigonelline as the hydrochloride and acid sulfate, respectively, representing modification and simplification of published methods, are described with their chemical properties and characteristic reactions. It was demonstrated that small amounts of trigonelline when heated to 75° C. with 6 N KOH in the presence of some source of ammonia yield a substance giving a color reaction by the Bandler and Hald method (*E. S. R.*, 82, p. 586) identical with that of nicotinic acid, and that the conversion amounts to about 70 percent of the trigonelline when small quantities of the starting material are used and decreasingly smaller percentages with larger amounts. On the basis of these reactions, it is concluded that "normal human subjects excrete daily only 1 to 3 mg. of nicotinic acid and derivatives (amide and glycine conjugate) compared with 30 to 50 mg. of trigonelline, and that nicotinic acid ingested in small doses (100 mg.) is excreted largely as trigonelline."

Pellagra in the average population of the Northern States, H. FIELD, JR., C. PARNALL, JR., and W. D. ROBINSON (*New England Jour. Med.*, 223 (1940), No. 9, pp. 307-315, figs. 4).—Commonly overlooked signs of chronic pellagra are described, with a number of case histories showing its frequent occurrence in the northern part of the United States. Prominent among the signs is hyperkeratosis, common sites of which are over skeletal pressure points and on the soles of the feet. Another common skin manifestation is an ichthyosis-like scaling over the greater part of the body. Other types of epithelial desquamation may also be present. Changes in the tongue not quite as marked as those commonly considered characteristic for pellagra but including a heavy coating, usually not extending over the reddened tips and sides, are often seen. Nervous and mental symptoms are varied, with a feeling of tenseness, irritability, mental depression, and emotional instability fairly common. Other symptoms include constipation, anorexia, and epigastric burning during or shortly after ingestion of food.

In the treatment of severe cases of chronic pellagra nicotinic acid in initial doses of 60 mg. six times a day and later reduced to from 80 to 160 mg. in three or four doses is recommended, with some natural source of the rest of the B complex in an amount furnishing from 600 to 700 Sherman units of riboflavin daily, with an attempt after the deficiency has been relieved to improve the diet so that further vitamin supplements will not be needed. It is noted, however, that "occasionally an apparently normal individual needs vitamin supplements in addition to a presumably normal diet."

Thiamin content of dried pork muscle, E. H. HUGHES. (Univ. Calif. and U. S. D. A.). (*Food Res.*, 6 (1941), No. 2, pp. 169-173, fig. 1).—The thiamin content of dried pork muscle was determined by biological assay, using chicks according to the method of Jukes and Heitman (*E. S. R.*, 82, p. 666). Ham muscle from pigs fed diets with little or no thiamin contained practically no thiamin, indicating the inability of the pig to synthesize the vitamin and store it in the muscle. Ham muscle from pigs receiving diets containing thiamin at levels of approximately 1, 4, and 6 mg. per 100 lb. of pig daily contained, respectively, from 5.1 to 5.8, from 15.0 to 19.3, and from >16.7 to 20.5 μ g. of thiamin per gram of dry muscle corresponding to averages of 1.4 μ g., 4.4, and 4.8 μ g. per gram calculated to the fresh basis. These findings are interpreted to indicate that the thiamin in the muscle of the pig is related to the amount ingested.

The effect of organic compounds upon vitamin C synthesis in the rat, H. E. LONGENACKER, H. H. FRICKE, and C. G. KING (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 497-510).—Continuing their investigation of pure substances which accelerate ascorbic acid synthesis and excretion in the rat (E. S. R., 83, p. 281), the authors have tested various substances unrelated in chemical structure but having the common characteristic in vivo of functioning as nerve depressants. Among the most active compounds were four series of anesthetics (barbituric acid derivatives, polymeric aldehydes, sulfonemethanes, and halogenated aliphatic compounds) and two antipyretics, aminopyrine and antipyrine. Doses of 20 mg. per day of representatives of these groups raised the ascorbic acid excretion in a few days from an initial value of about 0.2 mg. daily to values ranging from 7 to 18 mg. Phenols, salicylates, sulfanilamide, and sulfapyridine were only slightly active and narcotine and nicotinic acid fairly active, while hydroxyethylapocupreine and a number of alkaloids had practically no effect. That the increase in reducing substances as titrated with 2,6-dichlorophenolindophenol was ascorbic acid was proved by guinea pig assays for vitamin C on the rat urines.

In the discussion of the significance of these findings, it was concluded that the functional relationships of the compounds found to be active "point toward a close connection between vitamin C and the metabolism of nerve tissue. The increased synthesis of ascorbic acid constitutes a fairly rapid and continued response of the rat to at least an extensive number of nerve depressants. It is possible that the accelerated ascorbic acid synthesis is a protective mechanism available to the animal against foreign toxic substances, but there is no direct evidence that this is so. The phenomenon may also represent a disturbance of normal intermediate metabolism in which high ascorbic acid production is only one of a number of disturbed reactions."

The protein-bound form of vitamin C [trans. title], K. WACHHOLDER and A. OKBENT (*Klin. Wchnschr.*, 19 (1940), No. 22, pp. 532-533).—A brief note attempting to refute the claim of Holtz (E. S. R., 84, p. 710) that ascorbic acid exists in animal tissues partly as a bound form with protein.

Studies on the vitamin C metabolism of four preschool children, M. L. HATHAWAY and F. L. MEYER. (Cornell Univ.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 503-514).—Two boys and two girls of nursery school age (43.2-64 mo.) on a standard diet of low but known vitamin C content were given for eight periods of 1 or 2 weeks' duration ascorbic acid in amounts decreasing from 115 to 17 mg. daily, each period ending with a test dose of 200 mg. to check tissue saturation as determined by two criteria—(1) the excretion of 50 percent of the test dose and (2) the response of the individual child to the test dose following a period on 66 mg. of ascorbic acid daily. The Evelyn photoelectric colorimeter was used for the ascorbic acid determinations on the 24-hr. urine samples following the technic of Bessey (E. S. R., 82, p. 14) with slight modifications, and the Bessey method was also used for the analysis of the foods. Milk specially treated by the process described by Hand, Guthrie, and Sharp (E. S. R., 79, p. 678) furnished from 10 to 14 mg. of ascorbic acid per day and the other foods a total ascorbic acid content of from 3 to 6 mg. daily for each child.

At every ascorbic acid level from 115 to 42 mg. inclusive, the tissues of all of the children were saturated, as judged by criterion (1). On 31 mg. saturation was not reached by two of the subjects until the second period. At 17 mg. the tissues were not saturated in any of the children. As judged by criterion (2) all but one of the children passed the standard at the 31-mg. level. Little change was found in the quantity of ascorbic acid utilized on intakes

ranging from 30 to 50 mg., the average value for all subjects for four 2-week periods being 23 ± 2 mg. The percentage utilization was never higher than 77 percent and averaged 74 percent at the 31-mg. level and 47 percent at the 50-mg. level.

The authors conclude that for these children a daily intake of 31 mg. represented the marginal level for tissue saturation and that within the age limits the requirement was not related to sex, age, or body weight.

TEXTILES AND CLOTHING

Effect of light and heat on color and deterioration of viscose, acetate, and cuprammonium fabrics, H. FLETCHER and M. H. HOUSTON. (Kans. Expt. Sta.). (*Textile Res.*, 11 (1940), No. 1, pp. 4-11, figs. 5).—Three white viscose and three white cellulose acetate rayon fabrics, including in each case a flat crepe, a taffeta, and a satin fabric; and two white cuprammonium rayon fabrics, representing a fabric of twill weave and a sheer of plain weave, were used in these tests. All fabrics were scoured and sampled warpwise of the fabric by the raveled-strip method. Certain samples were exposed for periods of 20, 40, 60, 80, 100, and 120 hr., under conditions of controlled humidity and temperature, to light from a sunlight lamp giving an intensity of ultraviolet light of 4,000 footcandle minutes; others were heated in an electric oven at 270° – 280° F. for 10-, 20-, 30-, 40-, 50-, or 60-hr. periods; and still other samples were kept as controls. At the end of the treatments all samples were subjected to color analysis and to breaking strength and other tests. The results, discussed in detail and illustrated by graph, are summarized as follows by the author:

‘Light decreased the breaking strength of the viscose, acetate, and cuprammonium rayons uniformly. Heat decreased the breaking strength of all of them considerably, but the cellulose acetate rayons were more resistant to heat than the other two kinds. Light produced little change and heat much change in color. The cellulose acetate rayon fabrics were affected the least. The ash alkalinity showed no perceptible increase or decrease for any of the rayons exposed to light or heat. The amount of increase in the copper number and percent solubility in sodium hydroxide was approximately the same for the viscose and cuprammonium rayon fabrics, and it was less in the case of the cellulose acetate rayon fabrics. Thus the greater change in breaking strength, copper number, and percent solubility in sodium hydroxide indicate that the viscose and cuprammonium rayon fabrics were deteriorated more by heat than the cellulose acetate rayon fabrics.’

Buying boys' suits, C. L. SCOTT (*U. S. Dept. Agr., Farmers' Bul.* 1877 (1941), pp. [2]+18, figs. 14).—Construction, fabric, size, and fit are discussed as the important features in the selection of boys' suits. Practical tests and factual information are offered in this well-illustrated publication to help check these points of quality before purchase.

HOME MANAGEMENT AND EQUIPMENT

Family expenditures for housing and household operation: Five regions. Urban and village series, H. KYRK, D. MONBOE, K. CRONISTER, and M. PERRY (*U. S. Dept. Agr., Misc. Pub.* 432 (1941), pp. V+244, figs. 6).—This report, like ones noted previously (*E. S. R.*, 85, p. 284), is one of the group presenting details of expenditures for major budget categories. It is based on a survey of selected families in villages and small cities in five regions, and, without describing the facilities, is concerned merely with the outlay for family housing,

heat, and light. Included under outlays for family homes are renters' payments to their landlords and owners' expenditures for interest, taxes and assessments, repairs, and other items of upkeep; excluded are payments on the mortgage or expenditures for additions to owned homes. "The patterns of spending of home owners and of renters, as shown by this report, income class by income class, may be considered characteristic of patterns of the native-white nonrelief families with comparable incomes in these communities and in others similar in geographic location and in economic and cultural characteristics."

\$2,400 yearly farm family living expense is shown from 19-year record in Colorado. R. T. BURDICK (*Colo. Farm Bul. [Colorado Sta.], 3 (1941), No. 3, p. 5*).—An analysis of 203 records of family expenditures available for a 19-yr. period from 1922 to 1940, inclusive, showed an average annual expenditure of \$1,460 per family on personal and household expenses (including \$322 for automobile, electricity, telephone, and dwelling cash repairs), \$317 for depreciation and interest on dwelling and depreciation on automobile, and \$280 for farm family living, making a total of \$2,057 as the average combined cash expenditure and family living per farm family, or an average of \$451 per capita. It is considered that to allow for similar living standards in town where food prices would be higher, \$2,400 rather than \$2,100 (approximately) would be a fairer estimate of the living standard. The records analyzed further showed a range in cash expenditures from \$1,885 (in 1927) to \$849 (1932), in dwelling use and depreciation on automobile from \$441 (1928) to \$234 (1935), and in value of home-raised foods from \$394 (1924) to \$176 (1933). In 1927, the year with the highest total, each family averaged \$2,657 for all these items, while in 1932, the year with the lowest total, the average was \$1,319. These records of families of different size and of farm operators making a comfortable living are considered representative and suitable as a goal for satisfactory farm life under conditions similar to those in the northern Colorado irrigated area, the region involved in the present study.

Housing of 538 Vermont farm families. V. BRITTON (*Vermont Sta. Bul. 470 (1941), pp. 39, figs. 4*).—This report, continuing the series of analyses of the Vermont data from the consumer purchases study, presents an analysis of the housing data of farm families similar to that made earlier from data for the village families (*E. S. R., 85, p. 143*).

"The total income of the family had an important effect on its housing. Increased income was accompanied by rises in percentages having hot and cold water in the kitchen and bathroom, indoor flush toilets, kitchen sinks and drains, and central furnaces, and by increases in those owning their homes and such equipment as radios, pianos, refrigerators, motor-driven washing machines, vacuum cleaners, and electric sewing machines. As income increased, so did the amounts spent for housing, household operation and equipment. . . . Ownership of facilities and the expenses for housing, household operation and equipment decreased with added members when other factors were held constant, indicating that in order to better the housing of large families, their incomes have to be increased to a greater extent than is the case with small families. Housing, household operation and equipment expenses increased with the extent of the education of the husband when other factors were held constant, indicating that advanced education tends to improve the housing standard. Percentage of home ownership and expense for equipment increased with age, while housing, household operation, and total home expenses decreased with age when other factors were held constant, perhaps indicating diminished necessity for these types of expenditures."

Study of kinds and maintenance of floor finishes best suited for household use (*Rhode Island Sta. Rpt.* [1940], pp. 55-56).—This progress report (E. S. R., 84, p. 141) discusses the apparatus developed in the study and summarizes the findings to date (E. S. R., 84, p. 857).

MISCELLANEOUS

Statistical methods applied to economics and business, F. C. MILLS (*New York: Henry Holt & Co.* [1939], rev., pp. XIX+746, figs. [94]).—The systematic development for the student and research worker of the fundamentals of statistical methods for economics and business is presented. Examples of newer methods of analysis are presented, especially as they may be encountered in the laboratory.

Report of progress in solving Idaho's farm problems: Forty-eighth Annual Report [of Idaho Station] for the year ending December 31, 1940, C. W. HUNGERFORD ET AL. (*Idaho Sta. Bul.* 239 (1941), pp. 81, figs. 17).^o

Fifty-third Annual Report [of Kentucky Station], 1940, I, II, T. P. COOPER ET AL. (*Kentucky Sta. Rpt.* 1940, pts. 1, pp. 67; 2, pp. [2]+553+36, pls. 6, figs. 125).—Part 1 includes the report of the director.^o Part 2 contains reprints of Bulletins 398-410 and Circular 51, previously noted.

Biennial Report of the North Louisiana Experiment Station, Calhoun, Louisiana, 1939-1940, D. M. JOHNS ET AL. (*Louisiana Sta., North Louisiana Sta. Bien. Rpt.* 1939-40, pp. 43).^o

Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1939-1940, J. M. JENKINS ET AL. (Coop. U. S. D. A.). (*Louisiana Sta., Rice Sta. Bicen. Rpt.* 1939-40, pp. 42).^o

Annual Report of the Massachusetts Agricultural Experiment Station, 1940, F. J. SIEVERS ET AL. (*Massachusetts Sta. Bul.* 378 (1941), pp. 112, figs. 4).^o

Highlights of the work of the Mississippi Experiment Station: Fifty-third Annual Report for the fiscal year ending June 30, 1940, C. DORMAN (*Mississippi Sta. Rpt.* 1940, pp. 42).—This consists mainly of a reprint of articles previously noted (E. S. R., 85, pp. 292, 336, 344, 383, 410, 431).

Fifty-third Annual Report [of Rhode Island Station, 1940], B. E. GILBERT (*Rhode Island Sta. Rpt.* [1940], pp. 71).^o

[Index to Wyoming Station publications], M. LAMB (*Wyoming Sta. Index Bul. I* (1941), pp. 47).—This lists all bulletins and annual reports and certain other publications of the station, and indexes Bulletins 218-247 and reports 46-50 (E. S. R., 76, p. 431).

^o The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Florida University and Station.—George D. Thornton, assistant agronomist in the Georgia Station, has been appointed assistant professor of soils and assistant soil microbiologist.

Georgia Station.—Dr. Leah Ascham, head of the department of home economics, has accepted a position as associate professor and investigator in food economics and nutrition in the Kansas College and Station.

Indiana Station.—George A. Ficht, associate in entomology, died July 29 in his forty-second year. A native of Canada, he had been connected with the station since 1927. His investigations had been largely with the European corn borer, in which field he had published numerous papers.

E. R. Menefee, associate in poultry husbandry, has also been appointed executive secretary and treasurer and chief inspector of the State Egg Board as provided by an act passed by the last legislature. William Kohlmeyer of the extension service will take over his research in marketing.

Other appointments include J. H. Hilton as assistant chief of the department of dairy husbandry, R. H. King as assistant chemist, L. C. Shenberger as assistant inspector in the seed control, and Sidney B. Lague as junior agricultural statistician. H. P. Ulrich, assistant in the soil survey, has been granted leave of absence for military service.

Maine Station.—The appointment is noted of Dr. Kathryn E. Briwa as nutrition specialist, effective September 1.

Maryland University and Station.—Dr. L. A. Moore, research assistant in dairy husbandry in the Michigan Station, has been appointed associate professor of dairy husbandry and associate dairy husbandman.

Mississippi Station.—Dr. J. A. Pinckard, associate plant pathologist in the North Carolina Station, has been appointed head of the department of plant pathology.

New Mexico College and Station.—H. M. Milton, II, president of the college and lieutenant colonel in the National Guard, entered active military service on September 17. Dr. D. H. Nelson has assumed the duties of instructor in dairy husbandry vice F. M. Loewenstein, who is on leave of absence for military service.

L. H. Addington, associate professor of dairy husbandry and associate dairy husbandman, was killed in an automobile accident on September 24. He had been connected with the dairy work of the institution since 1927.

North Carolina College and Station.—A collection of current bulletins of the extension service and the station has been reprinted by the State Textbook Commission in an edition of 4,700 copies for the use of students in vocational agriculture in the State. The new volume will be placed in schools under the textbook rental system this fall, thereby greatly extending its availability for educational use.

Texas College.—Dr. John Ashton, associate professor of rural sociology, has been on leave for several months as adviser to the Department of Agriculture of Nicaragua. According to a note in *School and Society*, he reports that that country contemplates establishing an agricultural college and experiment station on the general pattern of those in the United States.

INDEX OF NAMES

- Abarbanel, A. R., 603.
 Abbot, C. G., 12
 Abbott, E. V., 495.
 Abbott, O. D., 270, 691.
 Abell, C. A., 64.
 Abmeyer, E., 47.
 Abt, A. F., 425.
 Ackerman, E. A., 12.
 Ackert, J. E., 104, 499, 511,
 664.
 Ackley, A. B., 64.
 Acree, F., Jr., 502, 585.
 Acree, S. F., 9.
 Adair, C. R., 175.
 Adair, L. A., 206.
 Adams, A. E., 603.
 Adams, C. F., 88.
 Adams, C. L., 31.
 Adams, R. H., 500.
 Adams, W. L., 314.
 Adams, W. E., 766.
 Adamson, A. M., 83.
 Adamstone, F. B., 604, 673.
 Addicott, F. T., 318.
 Addington, L. H., 865.
 Adler, A., 671.
 Adler, F. H., 565.
 Adolph, W. H., 412.
 Aeppli, D. C., 286.
 Afzal, M., 644.
 Ahlgren, H. L., 471, 472, 522.
 Ahmad, T., 644.
 Aicher, L. C., 92.
 Alkman, J. M., 182, 185, 257,
 301.
 Aitken, H. C., 647.
 Aiyer, A. K. Y. N., 810.
 Akamine, E. K., 181.
 Akers, H. A., 677.
 Albaum, H. G., 599.
 Alben, A. O., 313.
 Albert, A. R., 446, 471, 472,
 485, 488.
 Albert, W. B., 65.
 Albrecht, H. R., 470, 487, 499.
 Albrecht, W. A., 22, 163, 321,
 345, 736, 739.
 Alcebo, J., 798.
 Alderfer, R. B., 163.
 Aldrich, W. W., 57, 194.
 Alexander, E. R., 555.
 Alexander, L. M., 237.
 Alexandrov, V. G., 459.
 Alexandrova, O. G., 459.
 Alicata, J. E., 247, 535.
 Aline, E., 235, 857.
 Allard, H. A., 354, 458.
 Allbaugh, L. G., 262, 284.
 Allen, B. C., 603.
 Allen, C. H., 503.
 Allen, E. A., 255, 541.
 Allen, M. W., 217, 365.
 Allen, N., 84, 222.
 Allen, N. N., 519.
 Allen, P. W., 130.
 Allen, R. C., 60.
 Allen, T. C., 472, 503, 511.
 Allington, W. B., 488.
 Allison, F. E., 316, 317.
 Allison, J. B., 538.
 Allison, J. H., 788.
 Allison, J. L., 771.
 Allison, R. V., 590.
 Allman, S. L., 798.
 Allmendinger, D. F., 477, 481,
 487.
 Allred, B. W., 231.
 Allred, C. E., 410, 555, 684,
 685.
 Allyn, R. B., 732.
 Almquist, H. J., 90, 252, 255,
 383, 389, 574, 809.
 Alsberg, C. L., 433.
 Alter, J. C., 159.
 Alvord, B. F., 678.
 Alway, F. J., 22.
 Ames, O., 451.
 Amos, J. M., 84, 514.
 Andberg, W. G., 538.
 Andersen, A. M., 169.
 Andersen, E. M., 347.
 Anderson, A. B. C., 732.
 Anderson, A. G., 543.
 Anderson, A. L., 176.
 Anderson, B. E., 823.
 Anderson, C. A., 265.
 Anderson, C. S., 121.
 Anderson, D. B., 31, 169.
 Anderson, E. O., 520, 521, 534.
 Anderson, G. W., 98, 105.
 Anderson, H. D., 417, 825.
 Anderson, H. W., 75, 357, 623,
 635, 636.
 Anderson, J. E., 5, 40.
 Anderson, K. L., 40, 84.
 Anderson, L. C., 375.
 Anderson, L. D., 375, 502.
 Anderson, M. E., 209.
 Anderson, O. W., Jr., 604, 651.
 Anderson, P. J., 759.
 Anderson, S., 121, 294.
 Anderson, T. F., 32.
 Anderson, T. G., 811.
 Anderson, W. S., 342, 470,
 479.
 Andreeva, E. G., 386.
 Andrews, F. N., 37, 382.
 Andrews, F. S., 596, 619, 629.
 Andrews, F. W., 343.
 Andrews, J. S., 821.
 Andrews, W. B., 345.
 Andrus, C. F., 490.
 Andrus, W. D., 279.
 Angelo, E., 199.
 Anker, D. L. W., 830.
 Annand, P. N., 501.
 Annereaux, R. F., 536.
 Ansbacher, S., 139, 427, 714
 Anson, M. L., 457.
 Anthony, C. H., 287.
 Anthony, D. J., 254.
 Anthony, J. L., 341, 470.
 Antopol, W., 836.
 Apodaca, J. L., 679.
 Apple, J. W., 227.
 Appleby, A., 667.
 Appleman, C. O., 170.
 Appleman, D., 198.
 Arant, F. S., 499.
 Arbuckle, W. S., 246, 520, 521.
 Arbutnot, K. D., 501.
 Archer, G. T. L., 666.
 Archer, W., 98.
 Archibald, J. G., 809.
 Ardenne, M. von, 460.
 Ardrey, W. B., 529.
 Arenkova, D. N., 463.
 Aring, C. D., 138.
 Ark, P. A., 215, 489.
 Armentrout, W. W., 689.
 Armstrong, F. E., 400.
 Armstrong, G. M., 65, 490,
 628.
 Armstrong, J. M., 798.
 Armstrong, T., 785.
 Armstrong, W. D., 697.
 Arndt, C. H., 65.
 Arnold, A., 440.
 Arnold, H. A., 521.
 Arnold, P. T. D., 241, 651,
 656.
 Arnold, R. B., 242.
 Arnon, D. I., 20, 321, 454,
 737.
 Aron, H. C. S., 425.
 Arroyo, R., 444.
 Arthur, I. W., 262.
 Asbury, C. E., 57.

- Ascham, L., 765, 865.
 Asdell, S. A., 657.
 Ashbrook, F. G., 374.
 Ashburn, L. L., 276.
 Ashley, T. H., 52, 481.
 Ashton, J., 865.
 Ashworth, J., 855.
 Ashworth, U. S., 238, 521.
 Askew, V. C., 287.
 Aslett, M., 724.
 Asmundson, V. S., 178.
 Atchley, F. M., 264.
 Atkeson, F. W., 98, 104, 394.
 Atkin, L., 727.
 Atkinson, H. B., 159, 446, 587.
 Atwood, E. L., 733.
 Au, S. H., 784.
 Aubel, C. E., 92, 382, 803.
 Audus, L. J., 23, 456.
 Auerbach, C., 604.
 Aughtry, H. D., Jr., 174.
 Aurangabadkar, R. K., 16.
 Austoni, M. E., 695.
 Avena, A. W., 503.
 Averitt, S. D., 431.
 Aversa Saccà, R., 369.
 Avery, A. G., 173, 740.
 Avery, G. S., Jr., 169, 355, 741.
 Avery, J. L., 399, 402.
 Axelrod, A. E., 274, 275, 297.
 Axelrod, D. I., 170.
 Axelsson, J., 99, 522.
 Artmayer, J. H., 574.
 Ayers, T. T., 171, 372.
 Ayres, 160.
 Ayres, A. S., 739.
 Ayyar, P. N. K., 515, 645.
 Babb, M. F., 49, 762.
 Babcock, C. J., 104.
 Babcock, S. H., Jr., 133, 276.
 Babers, F. H., 797.
 Bacharach, A. L., 385, 573.
 Backus, E. J., 75.
 Bacon, L., 679.
 Baggette, T. L., 545.
 Bahart, G. M., 857.
 Bahler, D. R., 404.
 Bahler, G. P., 519.
 Bahrt, G. M., 369.
 Bailey, A. J., 581, 585, 717.
 Bailey, C. H., 181, 144, 433, 582, 691, 717.
 Bailey, D. M., 782.
 Bailey, E. M., 5, 652.
 Bailey, E. Z., 477.
 Bailey, G. W., 690.
 Bailey, H. E., 79.
 Bailey, I. W., 453.
 Bailey, J. S., 762.
 Bailey, L. H., 315, 477.
 Bailey, M. K., 217.
 Bailey, R. M., 49, 82, 217, 609, 620.
 Bailey, S. E., 789.
 Bailey, T. A., 446.
 Bailey, W. K., 85, 86.
 Bailey, W. W., 784.
 Bain, F. M., 449.
 Baines, R. C., 366.
 Bair, R. A., 340.
 Baird, A. B., 785.
 Baird, W. P., 194.
 Baker, A. Z., 711.
 Baker, D. W., 825.
 Baker, G. L., 5, 93.
 Baker, G. O., 729.
 Baker, J. H., 640.
 Baker, M. F., 82.
 Baker, M. L., 432.
 Baker, R. E. D., 370.
 Baker, W. C., 785.
 Bakhmeteff, B. A., 732.
 Bakke, A. L., 185, 205.
 Bald, J. G., 493.
 Balduf, W. V., 790.
 Baldwin, H. I., 64, 371.
 Baldwin, I. L., 32, 64, 66, 720.
 Baldwin, M., 161.
 Bale, W. F., 418.
 Ball, C. O., 693.
 Ball, E., 168.
 Ballard, J. C., 539.
 Ballard, S. S., 160.
 Ballentine, R., 442.
 Ballinger, R. A., 829.
 Bamford, R., 176.
 Bandel, D., 674.
 Banerjee, S., 425.
 Banerji, G. G., 568.
 Banfield, W. M., 781.
 Barbee, O. E., 471.
 Barber, G. W., 501, 796.
 Barber, H. G., 644.
 Barber, H. S., 89.
 Barcellos Fagundes, A., 318.
 Barger, E. H., 394.
 Barger, E. L., 713.
 Barger, W. R., 57.
 Barghoorn, E. S., Jr., 168, 173.
 Barham, H. N., 5.
 Barinova, R. A., 171, 320.
 Barker, D., 98.
 Barkworth, H., 395.
 Barnell, H. R., 692.
 Barnes, B. F., 183.
 Barnes, D. F., 501.
 Barnes, D. J., 696.
 Barnes, E. E., 450.
 Barnes, L. L., 418.
 Barnes, M. F., 399.
 Barnes, W. C., 42, 48.
 Barnett, R. J., 47.
 Barr, C. G., 5, 151.
 Barr, H. T., 196.
 Barre, H. J., 185, 287.
 Barrett, W. L., Jr., 501, 502.
 Barrons, K. C., 685.
 Bartholomew, E. T., 369, 623.
 Bartlett, B. R., 217, 502, 784.
 Bartlett, H. R., 434.
 Bartlett, J. B., 309.
 Bartlett, J. W., 176, 248, 327.
 Bartlett, K. A., 648, 798.
 Barton, L. V., 169, 344, 456.
 Baskett, T. S., 374.
 Bass, C. C., 542.
 Bass, T. C., 733.
 Bastedo, W. A., 588.
 Batchelder, A. C., 439.
 Bateman, G. Q., 239.
 Bates, W. D., 469.
 Bates, R. W., 605.
 Batson, F. S., 143, 624.
 Bauernfeind, J. C., 806.
 Baumann, C. A., 853.
 Baumann, R. V., 883.
 Baumhofer, L. G., 201.
 Baur, K. E., 446, 471, 478, 488, 503, 521, 779.
 Bausman, R. O., 117, 548.
 Bausor, S. C., 319.
 Bayer, L. D., 160, 307, 432, 447, 732.
 Bawden, F. C., 68, 359.
 Baxter, D. V., 358.
 Bay, C. E., 159, 587.
 Bayfield, E. G., 40.
 Bayliss, M., 666.
 Beach, B. A., 673.
 Beach, G. A., 60, 483, 781.
 Beal, J. M., 26.
 Beale, H. P., 630.
 Beale, O. W., 164.
 Beamers, P. R., 124.
 Beams, H. W., 784.
 Bean, H. W., 382.
 Bean, L. H., 548.
 Bean, P. L., 159.
 Bean, W. B., 414, 421.
 Bear, F. E., 168, 480.
 Bear, R. S., 151.
 Beard, D., 403.
 Beard, F. J., 176, 231.
 Beard, J. W., 402, 403.
 Beardsley, C. L., 6.
 Bearnse, G. E., 96, 466, 518.
 Beasley, R. F., 544.
 Beater, B. E., 446.
 Beaudette, F. R., 113, 254, 538, 664, 827.
 Beaumont, A. B., 729.
 Beaumont, J. H., 190, 286.
 Beavens, E. A., 154, 301.
 Beavers, D., 299.
 Bechdel, S. L., 656.
 Bechtel, H. E., 98.
 Beck, G. H., 98, 394.
 Beck, J. D., 536.
 Beckenbach, J. R., 539, 619, 629.
 Becker, E. R., 217, 539, 667, 784.
 Becker, R. B., 241, 651, 656.
 Becker, W. B., 787.
 Beckwith, C. S., 510.
 Bedford, C. L., 144.
 Beers, E. J., 431.
 Beers, H. W., 120.

- Beers, Z. H., 431.
 Beerstecher, E., Jr., 181.
 Beasley, T. E., 303.
 Beeson, K. C., 730.
 Beeson, W. M., 800, 802, 815.
 Beier, R. L., 784.
 Beilmann, A. P., 173.
 Bell, C. E., 589.
 Bell, R. W., 520.
 Bell, T. D., 332, 750.
 Benbrook, E. A., 217.
 Bender, C. B., 232, 519.
 Bender, T. R., 782.
 Bendixen, H. A., 521, 524.
 Ben-Dor, B., 255, 390.
 Benedict, H. M., 183, 323
 Bengtson, J. W., 338.
 Benham, G. H., 673.
 Bennet-Clark, T. A., 27.
 Bennett, B. L., 402.
 Bennett, C. C., 65.
 Bennett, E., 724.
 Bennett, H. H., 17, 590.
 Bennett, H. O., 196, 763.
 Bennett, H. W., 336, 470.
 Bennett, J. P., 350.
 Bension, N. L., 808.
 Bennitt, R., 500.
 Benson, K. L., 284.
 Benson, L., 815, 452.
 Benson, N., 445.
 Bentley, F. I., 262.
 Bentley, F. L., 803.
 Bentley, R. C., 262, 268.
 Benton, C., 502.
 Beresford, H., 724, 828.
 Beresford, E., 94.
 Berge, S., 177.
 Bergen, W. R., 741.
 Bergen, W. von, 141.
 Berger, B. G., 641.
 Berger, J., 169, 853.
 Berger, K. C., 472.
 Bergfeld, A. J., 523.
 Bergman, A. J., 607.
 Bergman, H. F., 64, 762, 769.
 Berkeley, E. E., 325.
 Berkley, E. E., 595.
 Berkman, S., 398, 818.
 Berle, A. A., Jr., 2.
 Berman, R. L., 179.
 Bernard, M., 159, 587.
 Bernotavicz, J., 804.
 Berry, G. P., 254, 403.
 Berry, J. C., 238.
 Berry, L. N., 390.
 Berry, W. E., 350.
 Berryman, G., 671.
 Berryman, G. H., 127.
 Bertholf, L. M., 228.
 Bertram, F. E., 470.
 Besley, H. E., 545.
 Besley, L., 625.
 Besone, J., 155.
 Best, R. J., 212.
 Bethell, F. H., 694.
 Bethke, R. M., 801.
 Beule, J. D., 500.
 Beutner, E. L., 164, 302.
 Beveridge, W. I. B., 107.
 Bexon, D., 27.
 Beyer, A., 26.
 Beyers, E., 478.
 Beyers, O. J., 719.
 Beynum, J. van, 242, 243.
 Bhatia, H. L., 89.
 Bhima Rao, C. N., 814.
 Biale, J. B., 744.
 Bickell, E. A., 608.
 Bickford, W. G., 294.
 Bickley, W. E., 511.
 Bierer, B. W., 815.
 Bierig, A., 646.
 Bierman, H. R., 152.
 Biester, H. E., 537, 664.
 Bigger, J. H., 44, 789.
 Bigham, J. T., 797.
 Billes, D. J., 765.
 Biltz, R. O., 534.
 Binder-Johnson, H., 843.
 Bindloss, E. A., 168.
 Bindon, H. H., 303.
 Bing, F. C., 851.
 Binkley, A. M., 847.
 Binkley, S. B., 297, 427, 583
 Binney, T. H., 812.
 Birch, F. M., 537.
 Birch, R. R., 667.
 Bird, E. W., 239.
 Bird, H. B., 113, 235, 806.
 Bird, J. J., 470, 575.
 Bishop, K. S., 606.
 Bishop, R. K., 502.
 Biskind, G. R., 331, 333.
 Bissell, T. L., 765, 792.
 Bissonnette, T. H., 467, 605.
 Bitancourt, A. A., 77, 637.
 Bjorka, K., 121.
 Black, A., 441.
 Black, J. D., 689.
 Black, J. J., 538.
 Black, L. A., 394.
 Black, S., 337.
 Black, W. H., 382.
 Blackburn, N. D., 719.
 Blackman, M. W., 228.
 Blackmon, G. H., 197, 367,
 619.
 Blackstone, J. H., 575.
 Blair, G. W. S., 813.
 Blake, 231.
 Blake, H. E., 647.
 Blake, M. A., 55, 482, 496.
 Blake, S. F., 170.
 Blakeslee, A. F., 169, 173,
 326, 740.
 Blakeslee, L. H., 683.
 Blanchard, E., 281.
 Blanchard, E. L., 564, 847.
 Blanchard, R. A., 501.
 Blandau, R. J., 465, 603, 750.
 Blanding, S. G., 144.
 Blank, F., 31.
 Blank, L. M., 454, 492.
 Blankertz, D. F., 686.
 Blanton, F. S., 781, 785.
 Blaser, H. W., 169.
 Blaser, R. E., 589, 608.
 Blatherwick, N. R., 695.
 Bledsoe, R. P., 756.
 Blew, J. O., 259.
 Blish, M. J., 343.
 Bliss, C. I., 511.
 Bliss, D. E., 64, 77.
 Bloch, R., 169, 172, 740.
 Bloch, S., 334.
 Blodgett, C. O., 498.
 Blodgett, E. C., 357, 769.
 Blodgett, F. M., 493, 643,
 774, 776.
 Blood, K. D., 681.
 Blood, P. T., 46.
 Bloom, E., 384.
 Bloom, M. A., 604.
 Bloom, W., 604.
 Blore, I. C., 664.
 Blume, J. M., 312.
 Boardman, H. P., 159, 587.
 Bobb, M. L., 646.
 Boddie, G. F., 669.
 Bodine, E. W., 76.
 Bodman, G. B., 732.
 Boelter, M. D. D., 417.
 Boewe, G. H., 768.
 Bogert, L. J., 412.
 Boggs, M. M., 144, 478, 516,
 556, 720.
 Bogolyubsky, S. N., 328.
 Bohart, G. S., 558.
 Bohstedt, G., 100, 241, 391,
 516, 519, 522, 537, 651,
 652, 750.
 Boivin, A., 530.
 Bolander, C., 685.
 Boles, H. P., 511.
 Bolin, D. W., 724, 800, 502,
 815.
 Bolin, F. M., 255.
 Bolin, O., 44.
 Boling, J. L., 603.
 Bolley, H. L., 757.
 Bond, E. W., 664.
 Bond, T. E. T., 207.
 Bondar, G., 215.
 Bonde, R., 362, 609, 629.
 Bondy, F. F., 84, 502, 504.
 Bonnell, D. E., 502.
 Bonner, J., 170, 623.
 Bonner, J. P., 823.
 Bonnet, J. A., 730.
 Bonstall, J. A., 733.
 Boon-Long, T. S., 743.
 Boonstra, C. A., 842.
 Booth, A. N., 100.
 Booth, M., 830.
 Booth, R. B., 701.
 Boozer, G. W., 65.
 Borden, R. J., 736.
 Borsook, H., 568.
 Bortfeld, C. F., 117.
 Borthwick, H. A., 28.

- Bortree, A. L., 519.
 Boseck, J. K., 470.
 Bosshardt, D. K., 232.
 Bostwick, E. P., 155.
 Botero, R. O., 208.
 Botha, D. H., 85.
 Botjes, J. O., 72.
 Bottomley, A. C., 810.
 Botts, A. K., 301.
 Bottum, J. C., 834.
 Boughton, I. B., 109, 535.
 Bourne, A. I., 787.
 Bourne, G., 270.
 Boutwell, R. K., 418.
 Bowen, A. B., 42, 338.
 Bowen, P. R., 378.
 Bowers, J. L., 347.
 Bowie, A., 142.
 Bowie, E. H., 303.
 Boxell, K. C., 812.
 Boyce, A. M., 217, 376, 502, 649, 650.
 Boyce, H. R., 786.
 Boyd, F., 608.
 Boyd, F. T., 590, 608.
 Boyd, O. C., 214.
 Boyd, W. L., 39, 254, 391, 588, 820.
 Boyer, P. D., 178, 520.
 Boyes, W. W., 478.
 Boyle, P. E., 93.
 Bracken, A. F., 16.
 Bradford, H. E., 121.
 Bradshaw, K. E., 452.
 Bradshaw, T. E. T., 180.
 Brady, D. E., 800.
 Brady, D. S., 284.
 Branaman, G. A., 381.
 Brandly, C. A., 540.
 Brandon, J. F., 754.
 Brandwein, P. F., 69.
 Brasher, E. P., 476.
 Bratley, C. O., 57, 768.
 Bratley, H. E., 629, 641.
 Bray, C. I., 382.
 Bray, W. E., 139.
 Breakay, E. P., 471, 503.
 Breed, F., 664.
 Breed, R. S., 246, 814.
 Breger, T., 608.
 Breneman, W. R., 180, 603.
 Brenner, W. H., 738.
 Brennen, C. A., 472.
 Brentzel, W. E., 70, 72, 209, 494, 771.
 Breslove, B. B., 397.
 Brewer, C. R., 296, 659.
 Brewer, E. G., 498.
 Brewer, W., 273.
 Brewster, J. E., 239, 828, 683.
 Bridges, J. O., 618.
 Brier, G. W., 35, 827, 882.
 Brierley, P., 34, 215, 624.
 Briese, R. R., 725.
 Briggs, D. R., 580.
 Briggs, G., 478.
 Briggs, G. M., 804.
 Briggs, H. M., 382.
 Briggs, L. C., 746.
 Brigham, E. S., 523.
 Brigham, R., 267.
 Brindley, T. A., 786, 828.
 Brink, R. A., 471.
 Brinkhous, K. M., 428.
 Brinsmade, J. C., Jr., 189.
 Brion, A., 254.
 Britt, R. E., 804.
 Brittingham, W. H., 463.
 Britton, J. E., 351.
 Britton, J. W., 825.
 Britton, V., 143, 863.
 Briwa, K. E., 865.
 Broadfoot, W. M., 438.
 Brody, E. B., 38.
 Brody, H. W., 643, 778.
 Brody, S., 801.
 Bromley, S. W., 505, 789.
 Brooks, A. N., 629.
 Brooks, C., 55.
 Brooks, C. F., 302.
 Brooks, J. W., 503, 511.
 Brooks, R. M., 57.
 Brouwer, E., 240.
 Brown, A. A., 830.
 Brown, A. H., 169, 742.
 Brown, A. J., 687.
 Brown, A. M., 206.
 Brown, A. P., 571.
 Brown, A. W. A., 785, 786.
 Brown, B. A., 311.
 Brown, B. E., 357, 609.
 Brown, C. C., 205.
 Brown, E. G., 566.
 Brown, G. A., 381.
 Brown, H. B., 45, 752.
 Brown, H. M., 463.
 Brown, H. P., 203.
 Brown, H. W., 538.
 Brown, I. C., 161.
 Brown, J. C., 673.
 Brown, M. H., 733.
 Brown, N. A., 498.
 Brown, N. C., 259.
 Brown, R. A., 727.
 Brown, R. L., 477.
 Brown, R. M., 581.
 Brown, R. T., 199.
 Brown, W., 361.
 Brown, W. C., 526.
 Brown, W. H., 394.
 Brown, W. L., 765.
 Browning, G. M., 447, 732.
 Broyer, T. C., 451.
 Bruce, E. A., 452.
 Bruce, H. D., 486, 618.
 Bruce, W. G., 89, 879.
 Bruckner, J. H., 746.
 Bruner, D. W., 254.
 Bryan, A. H., 825.
 Bryan, C. S., 253.
 Bryan, J. E., Jr., 485.
 Bryant, H. W., 394.
 Bryant, L. R., 781.
 Bryson, H. R., 84.
 Buchanan, R. E., 182, 286.
 Buchanan, T. S., 64.
 Buchanan, W. D., 792.
 Buchholtz, W. F., 182, 205.
 Buchholtz, J. T., 173, 459.
 Buck, R. E., 853.
 Buckley, J. J. C., 818.
 Buckley, W. T., 728.
 Buckner, G. D., 96.
 Bucksteeg, W., 67.
 Buddington, A. R., 508.
 Buddie, M. B., 401.
 Bueding, E., 852.
 Bugbee, R. E., 514.
 Buhler, E. O., 204.
 Bulgakova, Z. P., 342.
 Bull, S., 658.
 Bullard, J. F., 382, 519.
 Buller, A. H. R., 746.
 Bullis, K. L., 664, 815.
 Bullock, J. F., 42, 65.
 Bullock, R. M., 477.
 Bunce, A. C., 262.
 Bunkfeldt, R., 279.
 Bunnell, I., 715.
 Bunzell, H. H., 453.
 Burdette, R. F., 551.
 Burdette, W. J., 746.
 Burdick, H. L., 503, 787.
 Burdick, R. T., 683, 863.
 Burger, J. W., 603.
 Burgess, E. D., 227.
 Burgess, I. M., 49, 620.
 Burgess, P. S., 717.
 Burgwald, L. H., 520, 521, 524.
 Burke, H. E., 644.
 Burke, P. M. A., 303.
 Burkhardt, G. J., 521, 545.
 Burkhardt, K., 728.
 Burkhart, L., 740.
 Burkholder, C. L., 52, 764, 788.
 Burkholder, P. R., 169, 172.
 Burkholder, W. H., 78, 771.
 Burkitt, W. H., 516.
 Burks, B. D., 798.
 Burlison, W. L., 337.
 Burmaster, B. R., 467.
 Burmaster, D. M., 406.
 Burnet, F. M., 490.
 Burnett, E. A., 431.
 Burnett, L. C., 182, 185.
 Burnham, D. R., 623.
 Burns, R. H., 382.
 Burr, G. O., 294, 295.
 Burrell, A. B., 214, 496, 621.
 Burrell, P. C., 347.
 Burrier, A. S., 549.
 Burrill, M. W., 37, 381, 606, 749.
 Burris, R. H., 32.
 Burrows, H., 181.
 Burson, P., 160.
 Burton, J. C., 802.
 Bush, G. M., 641.
 Bush, V., 289.

- Bushnell, J., 166.
 Bushnell, L. D., 104, 461.
 Buss, W. C., 647.
 Butler, L., 241.
 Butt, F. H., 83.
 Butt, H. B., 574.
 Butterfield, N. W., 191.
 Butts, D., 459.
 Buxton, P. A., 790.
 Buzacott, J. II., 90.
 Byerly, T. C., 431, 466, 603, 748, 827.
 Byers, H. G., 314.
 Bynum, E. K., 229.
 Byrne, J. L., 819.
 Bywaters, J. H., 466.

 Cady, R. C., 302, 543.
 Cain, J. C., 619, 621.
 Caine, A. B., 231, 381.
 Caine, G. B., 717.
 Calder, R. M., 665.
 Caldwell, J. S., 50, 154.
 Calkins, G. N., 784.
 Call, L. E., 143.
 Callaway, R. P., 336.
 Callaway, S., 641.
 Callen, E. O., 460.
 Callenbach, J. A., 503.
 Calvert, E. L., 73.
 Cameron, E., 798.
 Cameron, G. M., 520.
 Cameron, J. M., 786.
 Cameron, T. W. M., 106.
 Camp, A. F., 357, 619.
 Camp, J. P., 608.
 Camp, W. H., 170.
 Campbell, F. L., 642.
 Campbell, H. T., 478, 556.
 Campbell, J. A., 51, 345, 346, 348.
 Campbell, J. C., 493, 634.
 Campbell, J. T., 239.
 Campbell, K. H., 419.
 Campbell, L., 477, 478, 487, 488.
 Campbell, L. K., 413.
 Campbell, R. E., 785.
 Campbell, T. L., 431.
 Campbell, W. A., 79, 638.
 Campbell, W. G., 411.
 Canfield, T. H., 743.
 Cannon, C. Y., 176, 182, 238, 519.
 Cantor, A., 400.
 Carabia, J. P., 23.
 Card, C. G., 467.
 Card, D. G., 687.
 Card, L. E., 35, 388, 467.
 Cardinell, H. A., 545.
 Carlisle, B. E., 667.
 Carlson, F. W., 225.
 Carlson, J. W., 221, 615.
 Carlson, W. E., 672.
 Carlton, H., 551.
 Carlyle, E. C., 388.
 Carlyle, R. E., 33, 600.

 Carman, P. C., 732.
 Carncross, J. W., 480.
 Carne, H. R., 668.
 Carns, W. A., 42, 338.
 Carpenter, T. M., 691, 694.
 Carr, L. G., 170.
 Carrera, C. J. M., 66, 76.
 Carrigan, R. A., 589.
 Carrillo, S., 798.
 Carroll, J. C., 616.
 Carson, R. B., 595, 598.
 Carson, S. F., 456.
 Carter, A. S., 735.
 Carter, G., 718.
 Carter, J. C., 372.
 Carter, R. H., 785.
 Cartwright, O. L., 84.
 Carvalho, J. C. M., 87, 374.
 Carver, C. W., 376.
 Carver, J. S., 516.
 Carver, W. A., 475, 608.
 Case, A. A., 499.
 Casida, L. E., 327, 332, 750.
 Caspari, E., 225.
 Cassidy, W. E., 724.
 Cassil, C. C., 220.
 Castberg, H. T., 612.
 Castle, W. E., 747.
 Cathcart, C. S., 191.
 Cathcart, R. B., 92.
 Cathcart, S. L., 98.
 Cation, D., 65, 621.
 Cattaneo, C., 249.
 Caulfield, W. J., 98.
 Cave, H. W., 394.
 Cawley, J. D., 700.
 Cederquist, D., 126.
 Celino, M. S., 789.
 Chace, E. M., 155.
 Chadwick, L. C., 200, 201, 765.
 Chadwick, T. C., 11.
 Chagnon, G., 785.
 Chaiken, L. E., 356.
 Chamberlin, J. C., 501.
 Chamberlin, T. R., 503, 784.
 Chamberlin, V. D., 518, 547, 805, 808.
 Chance, F. S., 470.
 Chandler, A. C., 374.
 Chandler, C., 602.
 Chandler, F. B., 620, 622, 631.
 Chandler, S. C., 498, 788.
 Chandler, W. H., 215.
 Chandler, W. V., 166, 313.
 Chang, C. Y., 412, 425.
 Chang, M. C., 37.
 Chang, P. C., 412.
 Chapin, R. M., 664.
 Chapin, W. E., 477.
 Chapman, A. B., 391.
 Chapman, A. G., 626.
 Chapman, G. L., 766.
 Chapman, H. D., 357, 449.
 Chapman, P. J., 375, 503, 511.
 Chapman, P. W., 680.
 Chapman, W. H., 69.

 Charipper, H. A., 330, 603, 604.
 Chase, E. C., 33.
 Chase, F. M., 30.
 Chase, H. B., 746.
 Cheadle, V. I., 169.
 Cheatum, E. L., 783.
 Chen, K. K., 703.
 Cheng, L. T., 418.
 Chepill, W. S., 590.
 Cherewick, W. J., 634.
 Cherrington, V. A., 515.
 Chester, K. S., 357.
 Chick, H., 567, 856.
 Childers, N. F., 53, 643, 778.
 Childs, T. W., 78.
 Chilson, W. H., 524.
 Chilton, S. J. P., 338, 492.
 Chisholm, R. D., 642.
 Chitwood, B. G., 781.
 Choate, H. L., 12.
 Cholak, J., 698.
 Chou, T. P., 418.
 Chow, B. F., 603.
 Christ, E. G., 482.
 Christensen, B. V., 170.
 Christensen, J. F., 822.
 Christensen, J. V., 95.
 Christensen, L. M., 724, 828.
 Christensen, R. P., 684.
 Christenson, R. O., 539.
 Christgau, R. J., 382.
 Christiansen, J. E., 543.
 Christie, J. R., 365.
 Christopher, R. C., 470.
 Chucka, J. A., 609, 620.
 Chupp, C., 206.
 Church, J. E., 159, 444, 542, 729.
 Claassen, C., 471.
 Claassen, P. W., 220.
 Clagett, C. O., 692.
 Clapp, A. L., 40, 43.
 Clapp, P. F., 12.
 Clark, A. W., 756.
 Clark, E. S., 628.
 Clark, F., 270, 608.
 Clark, F. E., 208.
 Clark, F. H., 747.
 Clark, G. C., 85.
 Clark, J. H., 56.
 Clark, N., 575.
 Clark, T. A. B., 27.
 Clarke, M. F., 584.
 Clarke, M. K., 664, 815.
 Clausen, R. T., 170.
 Clay, S. B., 211.
 Clayton, B. S., 675.
 Clayton, C. N., 75.
 Clayton, E. E., 74.
 Clayton, H. H., 12.
 Clayton, M. M., 691.
 Cleckley, H. M., 358.
 Clements, E. S., 816.
 Clements, F. E., 316.
 Clements, H. F., 181, 190.
 Clifton, C. E., 156.

- Clore, W. J., 192, 471, 477, 478, 481, 482.
 Cloudman, A. M., 328, 330.
 Clyde, G. D., 159, 258, 587.
 Coaton, W. G. H., 85.
 Cobb, G. S., 365.
 Coblenz, J. M., 33.
 Cochran, F. D., 61.
 Cochran, H. L., 51, 348, 480, 762.
 Cochran, W. G., 182, 263.
 Cockrell, R. A., 325.
 Codd, A. R., 587.
 Code, C. F., 538.
 Coffey, W. C., 144, 717.
 Cohen, J. G., 332, 749.
 Cohen, R. L., 676.
 Cohen, S., 702.
 Colle, T. S., 162, 309.
 Colbitz, H. von, 168, 232.
 Colby, W. G., 189, 752, 769.
 Cole, C. G., 536, 664.
 Cole, C. L., 239, 327, 328.
 Cole, H. H., 94.
 Cole, J. R., 768.
 Cole, L. J., 461.
 Cole, R. K., 746.
 Cole, W. C., 238, 397.
 Colebrook, L., 399.
 Coleman, L. C., 746.
 Coleman, R., 336, 450.
 Coleman, S. H., 502.
 Coles, E. H., 40, 47.
 Colhoun, J., 493.
 Collet, M. H., 302.
 Collias, N., 604.
 Collins, C. W., 789.
 Collins, D. L., 638.
 Collins, E. V., 115, 184, 218, 257.
 Collins, G. P., 677, 830.
 Collins, M. A., 524.
 Colón, A. A., 731.
 Colovos, N. F., 385.
 Comar, C. L., 324, 595, 718.
 Combs, O. B., 478.
 Combs, W. B., 245, 521.
 Comin, D., 479.
 Commoner, B., 322, 599.
 Comstock, R. E., 327.
 Condit, I. J., 497, 765.
 Cone, J. F., 525.
 Conklin, A. E., 809.
 Conklin, C. T., 519.
 Conklin, M. E., 169.
 Connaughton, C. A., 159.
 Connell, W. A., 84, 508, 569.
 Conrad, J. P., 167.
 Conrad, V., 589.
 Conrat, H. L. F., 179, 297, 469.
 Constable, E. W., 735.
 Constance, L., 170.
 Constantine, J. F., 284.
 Converse, C. D., 304.
 Converse, H. T., 391.
 Cool, B. J., 190, 454.
 Cook, C. A., 584.
 Cook, D. B., 766.
 Cook, E. S., 359, 740.
 Cook, G. M., 272, 845.
 Cook, H. T., 628.
 Cook, J. W., 384, 516.
 Cook, L. J., 803.
 Cook, M. T., 64, 499.
 Cook, R. L., 167.
 Cook, W. H., 385.
 Cooke, W. B., 204.
 Cooley, R. A., 331, 640.
 Cooley, R. J., 246.
 Coombes, A. L., 384, 404, 539.
 Cooney, W. T., 804, 806.
 Coons, C. M., 270.
 Cooper, E. R., 75.
 Cooper, H. P., 42, 143, 357.
 Cooper, M. R., 678.
 Cooper, T. P., 864.
 Cooper, W. C., 197, 198.
 Cooper, W. E., 203.
 Copeland, L., 523.
 Coppens, F. M. V., 813.
 Copper, R. R., 44.
 Corbett, P., 729.
 Cornelius, D. R., 341.
 Corner, H. H., 669.
 Cornman, J. F., 338.
 Cory, E. N., 227, 375, 511, 791, 795.
 Costa, G. A., 532.
 Costa Lima, A. de, 85.
 Costas, L. A., 229.
 Coste, A. D., 74.
 Cottier, G. J., 515.
 Cotton, R. T., 376, 505, 789.
 Couch, J. F., 401, 725.
 Couch, J. R., 235, 837.
 Coulston, F., 114, 529.
 Coulter, R. W., 280.
 Coulter, S. T., 245.
 Counts, E., 529.
 Cowan, P. R., 44.
 Coward, K. H., 710.
 Cowart, F. F., 619.
 Cowgill, W. H., 501.
 Cowie, D. B., 457.
 Cowley, M. A., 294.
 Cowling, J. D., 176.
 Cox, A. J., 667.
 Cox, B. F., 821.
 Cox, G. J., 129.
 Cox, G. M., 182, 268.
 Cox, H. R., 168.
 Cox, R. F., 92.
 Coy, N. H., 441.
 Crafts, A. S., 618.
 Craig, F. W., 217.
 Craig, G. H., 676.
 Craige, A. H., Jr., 536, 537.
 Craige, J. E., 666.
 Craighead, F. C., 627.
 Cralley, E. M., 70.
 Crandall, G. C., 237, 808.
 Cravens, W. W., 516, 807.
 Crawford, A. B., 253.
 Crawford, C. L., 57.
 Crawford, J. C., 87.
 Crawford, L. C., 115.
 Crawford, W. S., 685.
 Cray, R. E., 719.
 Creager, D. B., 65, 371.
 Creek, C. R., 830.
 Creighton, H. B., 169, 355, 741.
 Crew, F. A. E., 604.
 Crile, G., 801.
 Crofton, H. D., 669.
 Cronister, K., 862.
 Crosby, M. A., 678.
 Crosier, W. F., 208, 209, 491.
 Cross, C. E., 752.
 Cross, F., 822.
 Cross, J. C., 673.
 Cross, S. N., 402.
 Crouch, H. M., 65.
 Crous, P. A., 478.
 Crowe, L. K., 244, 521.
 Crowe, P. R., 589.
 Crowley, D. J., 196, 471, 487, 503, 542.
 Crown, R. M., 604, 651.
 Cruess, W. V., 153, 155, 295, 299, 301.
 Cruickshank, E. M., 691.
 Culbert, J. R., 60.
 Culbertson, C. C., 176, 182, 231, 233, 262.
 Cullinan, F. P., 56, 352.
 Cullison, A. E., 143, 516.
 Culpepper, C. W., 50.
 Culton, T. G., 235.
 Cumings, G. A., 739.
 Cumley, R. W., 179, 746.
 Cummings, L. J., 62.
 Cummings, R. O., 269.
 Cummings, W. H., 485.
 Cummins, G. B., 23, 315.
 Cunningham, B., 603.
 Curl, A. L., 301.
 Curran, H. R., 32.
 Currence, T. M., 50, 708.
 Currey, E. A., 41, 342, 470.
 Curry, A. S., 763.
 Curtis, H. P., 281.
 Curtiss, C., 506.
 Curtiss, W. M., 837.
 Curzon, E., 106, 385.
 Cuthbertson, A., 85.
 Cuthbertson, W. F. J., 138.
 Cutler, H. H., 264, 720.
 Cutler, J. W., 665.
 Cutright, C. B., 643.
 da Câmara, M. de S., 66.
 Dachnowski-Stokes, A. P., 814, 446.
 Dadswell, H. E., 460.
 Daehnert, R., 503.
 Daft, F. S., 276.
 Dahlberg, A. C., 293, 393, 524, 726.
 Dable, C. D., 101, 395.

- Dahm, P. A., 797.
 Daigh, F. C., 84, 509.
 Dailey, D. T., 144.
 Daines, R. H., 211, 359, 368, 493, 634, 775, 776.
 Dalke, P. D., 874.
 Dalton, A. J., 96.
 da Luz, C. G., 66.
 Dam, H., 714.
 Dameron, W. H., 35, 382.
 D'Amour, F. E., 606.
 Daniel, D. M., 375.
 Daniel, H. A., 309, 473.
 Daniel, T. W., 720.
 Daniels, A. L., 747.
 Daniels, L. B., 219, 512.
 Dann, W. J., 234.
 Darby, C. W., 105.
 Darlow, A. E., 332, 471, 750.
 Darnell, A. L., 391.
 Darnielle, R. B., 407.
 Darrow, G. M., 56, 195, 368, 622.
 Das Gupta, S. N., 370.
 Datta, N. C., 9.
 Davey, A. E., 494.
 Davids, L. F., 747.
 Davidson, F. E., 40.
 Davidson, J. A., 235, 237, 653, 655.
 Davidson, J. B., 115, 160, 184, 257.
 Davidson, J. N., 324.
 Davidson, O. W., 200, 357.
 Davidson, R. W., 79, 638.
 Davidson, W. B., 666.
 Davies, C., 206.
 Davies, H. B., 343.
 Davies, R., 478.
 Davies, W., 315, 337.
 Davis, E. F., 420.
 Davis, F. E., 340.
 Davis, G. K., 382, 670.
 Davis, G. N., 191.
 Davis, H. A., 23.
 Davis, H. J., 96.
 Davis, H. P., 327.
 Davis, J. E., 272.
 Davis, J. G., 661.
 Davis, K. C., 677.
 Davis, K. P., 625.
 Davis, L. D., 56, 482.
 Davis, L. L., 144.
 Davis, R. E., 233.
 Davis, S. P., 35, 382.
 Davis, W. A., 406.
 Day, A. M., 639.
 Day, H. G., 560, 561.
 Day, L. H., 214.
 Day, M. W., 626.
 Dean, F. P., 502.
 Dean, G. A., 47.
 Dean, H. K., 240.
 Dean, H. T., 419.
 Dean, L. A., 160, 190.
 Dean, E. W., 217, 375.
 de Andrade, E. N., 767.
 Deane, D. D., 238.
 Deanealy, R., 181.
 Dearden, D. V., 814.
 Deatherage, F. E., 334.
 Deb, S. B., 322.
 De Beer, G. R., 464.
 Debler, E. B., 587.
 Decker, C. W., 520.
 Decker, G. C., 218.
 Decker, P., 774.
 Decker, S. W., 47, 117.
 de Costa Lima, A., 85.
 DeEds, 585, 667, 820.
 Deering, E. L., 64.
 DeFrance, J. A., 61, 200, 500.
 Degering, E. F., 632.
 de Gryse, J. J., 380.
 Delaplane, J. P., 540, 827.
 Delisle, A. L., 169.
 Delisle, B., 788.
 DeLoach, D. B., 552, 553, 685.
 Delwiche, E. J., 446, 471.
 Demidenko, T. T., 73, 171, 320.
 Denison, F. N., 586.
 Denny, F. E., 557.
 Denny, A. A., 502.
 Denton, C. A., 97, 809.
 DenUyl, D., 486.
 Dermen, H., 169.
 de R6th, A., 699.
 Descartes, S. L., 849.
 Deslandes, J. A., 71, 497.
 de Sousa da Camara, H., 63.
 Deszyck, E. J., 6.
 Detjen, L. R., 47.
 Detrick, L. E., 710.
 De Turk, E. E., 298, 357.
 Detwiler, S. B., Jr., 157.
 Deuel, H. J., Jr., 559, 560.
 DeVault, S. H., 551.
 DeVolt, H. M., 113, 748, 827.
 Devore, G. G., 587.
 DeWitt, J. B., 442.
 Dexter, S. T., 458.
 Deysher, E. F., 520.
 Dhawan, C. L., 738.
 Diachun, S., 495.
 Diamond, H., 12.
 Dias Pacheco, S., 848, 849.
 Dick, J. B., 470, 487.
 Dick, L. A., 269.
 Dicken, D. M., 82.
 Dickens, F. L., 804.
 Dicker, G. H. L., 219.
 Dickerson, G. E., 99, 391.
 Dickey, R. D., 200, 367, 619.
 Dickens, D., 268, 575.
 Dickinson, E. M., 404, 541.
 Dickman, S. R., 735.
 Dickson, R. C., 223.
 Dieffenbach, R., 639.
 Diehl, W. W., 315.
 Dieter, C. E., 508, 787.
 Dietz, C. F., 750, 761.
 Dijkstra, N. D., 240.
 Dillman, A. C., 471.
 Dimick, M. K., 422.
 Dimock, A. W., 216, 370.
 Dimond, A. E., 80, 64, 324.
 Dittman, L. P., 795.
 Dix, F. J., 813.
 Djaenoodin, R., 537.
 Doan, F. J., 660.
 Dobbins, T. N., 90.
 Dobler, M., 827.
 Dobson, N., 114.
 Doctor, N. S., 9.
 Dodd, J. D., 176.
 Dodd, K., 136.
 Dadds, M. L., 603.
 Dodge, B. O., 370, 618.
 Dodge, B. S., 25.
 Dodge, C. W., 25.
 Dodge, F. N., 198.
 Dodge, H. H., 503.
 Dodge, J. R., 143.
 Dodson, L. S., 410.
 Doehlt, C. A., 353.
 Doisy, E. A., 297, 427, 538, 607.
 Dolecek, E. L., 97.
 Dolger, H., 702.
 Dolgopoi, V. B., 665.
 Doljanski, L., 404.
 Doll, E. R., 256.
 Doll, R. J., 117.
 Doller, F. G., 293.
 Dolliver, M. A., 139, 427.
 Dominick, C. B., 702.
 Domm, L. V., 604.
 Donaldson, R. W., 729, 752.
 Donath, W. F., 806.
 Doneen, L. D., 349.
 Donner, M. H., 642, 787.
 Doneth, J. C., 265.
 Donley, J. E., 830.
 Donnelly, M., 741.
 Donovan, H. L., 431.
 Donovan, R. L., 144.
 Dooley, T. P., 501, 641.
 Doolittle, S. P., 360.
 Doran, W. L., 769.
 Dore, W. H., 161.
 Dorfman, A., 397.
 Dorfman, R. I., 180.
 D6ring, H., 240.
 Dorman, C., 41, 292, 312, 336, 344, 353, 383, 410, 430, 864.
 Dorsey, M. J., 54.
 Dorst, H. E., 214.
 Dortignac, E. J., 587.
 Doten, S. B., 575.
 Doty, D. M., 144.
 Doubly, J. A., 105.
 Doucette, C. F., 785.
 Dougherty, R. W., 395, 820.
 Doughy, J. L., 591.
 Douglas, H. C., 33.
 Douglas, W. A., 505, 772.
 Douglass, A. E., 460.
 Dove, W. E., 798.
 Dove, W. F., 691.

- Dow, R. B., 853.
 Dowd, L. B., 521.
 Dowden, P. B., 229, 280.
 Dowell, A. A., 121, 837.
 Dowell, C. T., 718.
 Downing, J. M., 258.
 Downing, V. F., 105.
 Downs, P. A., 103, 394.
 Drain, B. D., 470, 477.
 Drake, C. J., 205, 218, 644, 790.
 Drake, M., 631.
 Draper, C., 720.
 Drechsler, C., 452.
 Dreesen, W. H., 487.
 Dreesen, W. C., 642.
 Dreosti, G. M., 479.
 Dreskin, H. O., 538.
 Driggers, B. F., 514.
 Driggers, J. C., 651.
 Drosdoff, M., 161.
 Drummond, J. C., 138, 573, 652.
 Dryden, L. P., 519.
 DuBois, C. W., 124, 155, 847.
 Dubos, R. J., 174, 248, 249, 250, 251.
 du Buy, H. G., 169.
 Duckworth, C. U., 647.
 Duckworth, J., 127.
 Dudley, F. J., 805.
 Duff, D. C. G., 78.
 Duffee, F. W., 472, 478.
 Duffield, J. W., 356, 464.
 Duggan, I. W., 680.
 Duggar, B. M., 30, 170, 324.
 Duggar, J. F., 470.
 Duis, W. H., 622.
 Duke, K. L., 750.
 Du Mont, P. A., 499.
 Duncan, C. W., 392.
 Duncan, H. R., 382.
 Duncan, W. H., 170, 171, 354.
 Dundas, B., 492.
 Dungan, G. H., 44, 361.
 Dunkelberg, G. H., 42, 115.
 Dunklee, R. B., 594.
 Dunlap, A. A., 71, 357.
 Dunlap, F. L., 5.
 Dunlap, G. L., 664.
 Dunlavy, H. E., 474.
 Dunn, D., 64.
 Dunn, G. E., 303.
 Dunn, L. C., 445.
 Dunn, L. E., 593.
 Dunn, M. S., 710.
 Dunn, P. M., 202.
 du Plessis, C., 85.
 du Plessis, S. J., 368.
 Dupuy, H. J., 106.
 Durant, A. J., 256, 640, 664.
 Durrell, W. D., 620.
 Durrell, L. W., 76, 616.
 Duruz, W. P., 197.
 Dustan, G. G., 786.
 Dustman, R. B., 526.
 Dutcher, R. A., 277, 656.
 Dutky, S. R., 512.
 du Toit, B. A., 391.
 Du Toit, P. J., 234.
 Dwarka Nath Nanda, 644.
 Dyer, A. J., 386.
 Dykstra, T. P., 494.
 Dyme, H. C., 854.
 Eames, B., 739.
 Earle, F. R., 158.
 Eastlick, H. L., 605.
 Eaton, C. B., 792.
 Eaton, F. M., 367, 451.
 Eaton, O. N., 177.
 Eaton, S. V., 321.
 Eby, C., 184, 545.
 Eby, F. H., 451.
 Eckardt, R. E., 569.
 Ecker, E. B., 709.
 Eckhardt, R. C., 185, 205.
 Eckler, C. B., 703.
 Eddins, A. L., 608, 629, 768.
 Eddy, C. W., 300, 556, 585, 667, 820.
 Edelmann, A., 607.
 Eden, A., 668.
 Edgar, R., 283.
 Edgar, S. A., 409, 500.
 Edgerton, C. W., 364, 493.
 Edleisen, N. E., 732.
 Edman, G., 247.
 Edminster, F. C., 500.
 Edmond, J. B., 42, 48.
 Edmonds, J. L., 381.
 Edmondson, J., 520, 521.
 Edson, H. A., 769.
 Edwards, E. E., 216.
 Edwards, F. R., 381, 802.
 Edwards, J., 604.
 Edwards, P. R., 254, 666.
 Edwards, T. L., 642.
 Efferson, J. N., 264, 829.
 Eggers, E. R., 484.
 Eggert, R. J., 117.
 Eggleston, W. W., 170.
 Eghis, S. A., 462.
 Egner, H., 21.
 Eheart, M. S., 708.
 Ehrlich, J., 740.
 Eichhorn, A., 253.
 Eichhorn, E. A., 538.
 Eichmann, R. D., 503.
 Eigsti, O. J., 169.
 Eisenlohr, W. S., Jr., 115.
 Eisenmenger, W. S., 729, 752.
 Eke, P. A., 829.
 Eldredge, I. F., 62.
 Eldredge, J. C., 185.
 Elgart, S., 726.
 Elges, C., 159, 303, 444, 542.
 Ellenberg, M., 702.
 Ellenberger, H. B., 528.
 Ellenwood, C. W., 194, 481, 764.
 Eller, J. J., 131.
 Elliker, P. R., 103, 394, 519, 520, 812.
 Elliot, R., 830.
 Elliott, C., 269, 774.
 Elliott, H., 2.
 Elliott, M. A., 9.
 Ellis, D. E., 634.
 Ellis, D. J., 460.
 Ellis, D. M., 835.
 Ellis, N. R., 517.
 Ellis, V. R., 309.
 Ellyson, R. G., 689.
 Elmendorf, E., 556.
 Elmer, O. H., 65.
 El-Rafey, M. S., 520.
 Elrod, J. B., 720.
 Elrod, J. C., 552.
 Elrod, E. P., 32.
 El Sadr, M. M., 856.
 Elsasser, W. M., 589.
 Elson, J., 448.
 Eltinge, E. T., 777.
 Elvehjem, C. A., 132, 274, 275, 277, 297, 387, 413, 417, 422, 516, 566, 582, 583, 673, 699, 804, 807.
 Elwell, H. M., 309, 473.
 Ely, F., 392, 519.
 Emerson, G. A., 36, 426.
 Emerson, J. A., 394.
 Emerson, R., 173.
 Emery, F. E., 606.
 Emmart, E. W., 817.
 Emmel, M. W., 113, 665.
 Emmens, C. W., 180, 181, 334.
 Emmert, E. M., 5, 48.
 Emmett, A. D., 727.
 Emori, M., 529.
 Emsweller, S. L., 34.
 Encarnacion, F. T., 174.
 Engel, R. W., 277, 566.
 Engelman, G., 337.
 England, C. W., 521, 545.
 Engle, P., 606.
 Englehorn, A. J., 160, 312.
 English, H., 487.
 English, J., Jr., 599.
 English, L. L., 380, 499.
 English, P. F., 374.
 English, W. H., 75.
 Englund, E., 548.
 Ensminger, D., 410.
 Ensminger, L. E., 729, 730.
 Ensminger, M. E., 718.
 Epling, C., 170.
 Epp, A. W., 287.
 Epprecht, A., 440.
 Eppstein, S. H., 278.
 Erb, J. H., 520.
 Erhart, A. B., 40.
 Erickson, R. O., 451.
 Ericson, S., 315.
 Erikson, G. E., 380.
 Errington, B. J., 111, 112, 408.
 Errington, P. L., 217.
 Ervin, C. D., 463.
 Erwin, A. T., 182.
 Erwin, E. T., 190.

- Esau, K., 64, 169, 364.
 Eshbaugh, E. P., 47.
 Espe, D. L., 238, 519.
 Esplin, A. C., 716.
 W. B., Jr., 719.
 Ettesvold, W. L., 117, 286, 339.
 Ettlinger, J. M., 316.
 Evans, A. W., 214.
 Evans, C. A., 672.
 Evans, F. R., 32.
 Evans, H. M., 36, 179, 297, 335, 426, 469, 606, 607.
 Evans, J. A., 375.
 Evans, J. S., 606.
 Evans, M., 141.
 Evans, M. W., 43, 453.
 Evans, R. E., 517.
 Evans, T. C., 641.
 Everest, F. A., 409.
 Ewan, J., 170.
 Ezeziel, M., 676.
 Ezeziel, W. N., 206, 768.
 Ezell, B. D., 366.
 Faber, J. E., 398.
 Fabian, F. W., 126, 248, 295, 299, 849.
 Fagerlind, F., 462.
 Fagundes, A. B., 318.
 Fahey, J. E., 219, 789.
 Fairbanks, B. W., 106, 127, 385.
 Fairbrother, R. W., 529.
 Fairhall, L. T., 642.
 Falconer, J. I., 548, 830.
 Fallis, A. M., 88.
 Fallscheer, H., 477, 503.
 Fang, C. Y., 692.
 Fargo, J. M., 516, 537.
 Farinas, E. C., 95.
 Farish, L. R., 347, 479.
 Farley, H., 104.
 Farmer, C. J., 425.
 Farnsworth, H. C., 265, 548.
 Faron, S., 523.
 Farquharson, J., 821.
 Farr, W. K., 169, 595.
 Farrah, G. H., 521.
 Farrall, A. W., 520.
 Farrar, C. L., 502.
 Farrar, J. L., 354.
 Farrington, O. M., 687.
 Farrow, R. C., 159, 587.
 Farstad, C., 91.
 Fassig, W. W., 504.
 Fauber, H., 476.
 Fawcett, H. S., 77, 369, 628, 637.
 Fawcett, K. I., 886.
 Feeney, R. E., 275.
 Fehlmann, H. A., 420.
 Fehmerling, G. B., 619.
 Fekete, E., 328.
 Feldman, W. H., 664.
 Fellers, C. R., 134, 156, 300, 376, 640, 644, 718, 724, 804, 828, 853.
 Fellows, H., 65.
 Felton, H. L., 510.
 Fels, S. S., 332, 749.
 Felt, E. P., 505, 789.
 Fenske, L., 829.
 Fenstermacher, R., 827.
 Fenton, F., 134, 571.
 Fenton, F. A., 84, 473, 505.
 Fenton, F. C., 40, 116, 524.
 Feodoroff, N. V., 732.
 Ferguson, F. F., 457.
 Ferguson, J., 668.
 Fernandes, J. S., 665.
 Fernholz, E., 139, 427, 714.
 Ferrero, A., 464.
 Ferrier, W. T., 118.
 Ferris, E. B., 41, 336, 342, 470.
 Ferris, L. P., II, 287.
 Fevold, H. L., 333.
 Ficht, G. A., 865.
 Ficke, C. H., 65.
 Field, A. M., 121.
 Field, H., Jr., 584, 560.
 Fieser, L. F., 443.
 Fifield, W. M., 187, 608, 619.
 Filingier, G. A., 47, 622.
 Filmer, B. S., 228, 514.
 Fincher, A. H., 59.
 Finch, R. B., 282.
 Fincher, M. G., 671.
 Findlay, W. P. K., 498.
 Findlen, P., 269.
 Fine, L. O., 446.
 Finger, C. J., Jr., 733.
 Fink, D. S., 593, 609, 620.
 Finkelstein, H., 403.
 Finlay, C. E., 647.
 Finner, W. F., 683.
 Firkins, B. J., 160.
 Fischer, G. W., 358, 487, 632.
 Fischer, R., 317.
 Fisher, C. K., 501.
 Fisher, D. F., 58, 154.
 Fisher, D. V., 55, 351.
 Fisher, P. L., 373.
 Fisher, R. A., 786.
 Fisher, R. C., 645.
 Fister, L. A., 477.
 Fitch, C. P., 391.
 Fitch, J. E., 519.
 Fitzgerald, D. V., 379.
 Fitzgerald, J. S., 91.
 Fitzpatrick, E. G., 303.
 Fitzpatrick, W. H., 724.
 Flanders, S. E., 784.
 Flanigan, G. E., 520.
 Fleming, C. E., 472, 516.
 Fleming, D. T., 190.
 Fleming, W. E., 227.
 Fleming, F., 595.
 Fleshman, C. L., 524.
 Fletcher, H., 142, 862.
 Fletcher, J. E., 307.
 Flint, L. H., 493.
 Flint, O. S., 815.
 Flint, W. P., 493, 645, 788.
 Flock, R. A., 217.
 Flor, H. H., 774.
 Flora, C. C., 520.
 Flory, W. S., Jr., 176.
 Fluhmann, C. F., 179.
 Fluke, C. L., 503.
 Flynn, J. E., 427.
 Fohrman, M. H., 391.
 Folley, S. J., 810.
 Folles, R. H., Jr., 561.
 Folse, C. D., 820.
 Folsom, D., 629.
 Foltz, V. D., 98, 104, 400, 663.
 Foord, D. C., 394, 395.
 Forbes, E. B., 724.
 Forbes, I. L., 763.
 Forbes, J. C., 819.
 Ford, O. W., 788.
 Forrester, J. S., 106.
 Forsberg, J. L., 782.
 Forsee, W. T., 590, 608, 619.
 Fosberg, F. R., 170, 451.
 Foster, A., 519.
 Foster, A. C., 193.
 Foster, A. S., 169.
 Foster, E. M., 662.
 Foster, E. O., 168, 232.
 Foster, H. H., 357.
 Foster, J. W., 456.
 Foster, W. A., 287.
 Foster, Z. C., 14.
 Foter, M. J., 157, 521.
 Fouad el Gammal, M., 88.
 Fountaine, F. C., 238, 809, 815.
 Fourt, D. L., 238, 809, 815.
 Foust, H. L., 107.
 Fouts, E. L., 103.
 Fowells, H. A., 626.
 Fowlds, M., 757.
 Fowler, R. H., 165.
 Fox, C. C., 221, 230.
 Fox, H., 89.
 Fox, K. R., 282, 430.
 Fox, R. L., 302.
 Fox-Timmling, E., 424.
 Fraenkel, G. S., 81.
 Fraenkel Conrat, H. L., 179, 297, 469.
 France, R. L., 724.
 Francioni, J. B. Jr., 96.
 Franck, J., 173, 600.
 Franck, O., 738.
 Franco, C. M., 324.
 Frandsen, J. H., 809.
 Frank, G., 690.
 Frank, H., 136.
 Frank, R. T., 37, 179, 749.
 Franklin, H. J., 643, 786, 828.
 Franklin, H. L., 679.
 Franklin, M. T., 363, 365.
 Fraps, G. S., 313, 388.
 Fraser, J. G. C., 71.
 Fraser, W. J., 242.

- Frazier, J. C., 40.
 Frazier, W. A., 346.
 Frazier, W. C., 662.
 Fred, E. B., 32, 436.
 Frederick, C. A., 277.
 Free, A. H., 423.
 Freeborn, S. B., 143.
 Freeman, D. B., 159, 587.
 Freeman, H. F., 583.
 Freeman, M. E., 845.
 Freeman, O. M., 176.
 Freeman, T. R., 520.
 Freeman, V. A., 284, 382, 670.
 Freeman, W. H., 288.
 Freer, G. H., 527.
 French, A. P., 762.
 French, C. S., 33, 169.
 French, R. B., 7, 691.
 Frey, C. N., 436, 727.
 Frezzi, M. J., 77.
 Fricke, H. H., 861.
 Friend, W. H., 191, 623.
 Frings, H., 502.
 Fritz, J. C., 98.
 Fritz, R., 84.
 Froker, R. K., 523.
 Frolik, A. L., 44, 184.
 Frolik, E. F., 44.
 Fromme, F. D., 286.
 Frost, S. W., 502.
 Frutchey, C. W., 733.
 Fryer, H. C., 288.
 Fudge, B. R., 619.
 Fudge, J. F., 813.
 Fuelleman, R. F., 337.
 Fugo, N. W., 38.
 Fukano, K., 529.
 Fukunaga, E. T., 160, 190.
 Fukushi, T., 643.
 Fukusho, K., 528.
 Fuller, A. T., 399.
 Fuller, H. S., 379.
 Fuller, J. E., 724, 729, 809.
 Fuller, S. A., 105.
 Fullerton, H. W., 443.
 Fulton, R. A., 221.
 Fulton, R. W., 488, 630.
 Funchess, M. J., 575.
 Funk, D., 608.
 Furniss, R. L., 230.
 Furnstal, A. H., 451.
 Furry, M. S., 283.
 Furth, J., 746.
 Gabbard, L. P., 448.
 Gabriel, H. S., 117.
 Gabrielson, I. N., 81, 783.
 Gadd, J. D., 537.
 Gaeb, R. R., 164, 302.
 Gaer, J., 585.
 Gaessler, W. G., 151, 185, 613.
 Gaffron, H., 178.
 Gaban, J. B., 218, 219.
 Gaines, E. F., 471, 487.
 Gaines, J. G., 74.
 Gaines, R. C., 504.
 Gaines, W. L., 242.
 Gainey, P. L., 13, 592.
 Gallagher, F. H., 83.
 Gallenne, J. H., 303.
 Gallup, W. D., 391, 520.
 Gapuz, R. B., 399.
 Garber, R. J., 338.
 Garcia, F., 286.
 Garcia Rada, G., 215.
 Gard, L. E., 337.
 Gardner, F. E., 55.
 Gardner, R., 14, 732.
 Gardner, V. R., 143, 184, 665, 717.
 Gardner, W., 732.
 Gardner, W. U., 38, 39, 332.
 Garey, J. C., 662.
 Garey, L. F., 719.
 Garin, A. N., 448.
 Garland, W., 787.
 Garner, F. H., 381.
 Garren, K. H., 79, 80, 576.
 Garrett, O. F., 232, 242, 243.
 Garrett, S. D., 209.
 Garrigus, W. P., 431.
 Garrison, C. S., 508.
 Garrison, E. R., 101, 394, 521.
 Garrison, O. B., 42, 48.
 Garriss, H. R., 634.
 Gashwiler, J. S., 405.
 Gassner, F. X., 389.
 Gatchell, E. C., 33.
 Gates, F. C., 315, 336.
 Gates, R. E., 326.
 Gatz, A. J., 603.
 Gauger, H. C., 823.
 Gaunt, R., 607.
 Gause, G. R., 407.
 Gauvreau, M., 595.
 Gavin, G., 413.
 Gay, F. J., 91.
 Gaylord, F. C., 836.
 Gearreald, T. N., 838.
 Geddes, J. A., 690.
 Geiger, C., 297, 326.
 Geissler, G. H., 794.
 Gemmer, E. W., 626.
 Genaux, C. M., 201.
 Generoso, J. D., 405.
 Genter, C. F., 463.
 Georgi, C. E., 316.
 Gerberg, E. J., 643.
 Gerdel, R. W., 17.
 Gerhard, E., 323.
 Gerhardt, F., 366.
 Gerlaugh, P., 303.
 Gershenfeld, L., 819.
 Gershenson, S., 465.
 Gershon-Cohen, J., 332, 749.
 Gershoy, A., 176.
 Gerstell, R., 500.
 Gholson, J. H., 521.
 Gibbons, W. J., 527, 671.
 Gibbs, J. B., 679.
 Gibson, C. A., 662.
 Gibson, K. E., 503.
 Gier, L. J., 169.
 Giersch, M. C., 740.
 Giese, H., 257.
 Gieseking, J. E., 730.
 Gifford, R., 287.
 Gilbert, B. E., 864.
 Gilbert, S. G., 28.
 Gilbertson, H. W., 122.
 Gile, B. M., 678.
 Gile, P. L., 14.
 Gilgut, C. J., 769.
 Gill, D. A., 109.
 Gillam, A. E., 100.
 Gillam, W. S., 162.
 Gilligan, G. M., 13, 40, 593.
 Gilliland, J. R., 370.
 Gilliland, R., 153.
 Gilman, C. C., 472.
 Gilman, H. L., 667.
 Gilmore, J. U., 84.
 Gilmore, L. O., 232.
 Giltin, W. F., 394.
 Giltner, L. T., 664.
 Gingham, C. T., 641.
 Ginsburg, J. M., 507.
 Giovine, N., 399.
 Girault, A. A., 287.
 Giri, K. V., 705.
 Gist, M. N., 608.
 Gist, N. P., 841.
 Glivan, C. V., 732.
 Glass, E. H., 646.
 Glasscock, H. H., 363.
 Glavind, J., 441, 714.
 Glaze, R. A., 547.
 Glazier, L. R., 809, 812.
 Gleissner, B. D., 795.
 Glick, D. P., 362, 776.
 Glock, W. S., 302.
 Glover, J., 596.
 Gnädinger, C. B., 230.
 Gobel, A. R., 785, 792.
 Goble, F. C., 402, 648.
 Godbey, E. G., 92.
 Goddard, D. R., 169, 742.
 Godden, W., 127, 652.
 Godfrey, G. H., 64, 357, 768.
 Godoy, E. F., 74.
 Goke, A. W., 803.
 Goldbeck, A. T., 732.
 Goldblatt, H., 569.
 Goldhamer, S. M., 694.
 Golding, N. S., 238, 521.
 Goldman, M., 731.
 Goldsmith, G. W., 210.
 Golightly, W. H., 377.
 Golumbic, C., 153.
 Gomes da Luz, C., 66.
 Gomez, E. T., 519.
 Gomori, G., 697.
 Good, E. S., 431.
 Gooding, T. H., 734.
 Goodhart, R., 563.
 Goodhue, L. D., 220, 226.
 Goodings, A. C., 429.
 Goodwin, E. M., 679.
 Goodwin, M. W., 5, 65, 84, 100, 365.
 Goodwin, R. H., 169, 745.

- Goot, P. van der, 86.
 Gordon, A. S., 330, 603, 604.
 Gordon, H. M., 106, 110.
 Gordon, M., 746.
 Gordon, S., Jr., 823.
 Gordon, W. L., 204.
 Gordon-Duff, D. C., 78.
 Gore, U. R., 186.
 Goresline, H. E., 301.
 Gorham, P. R., 318.
 Gorham, R. P., 785.
 Gorlenko, M. V., 359.
 Gortner, R. A., 580, 581, 828.
 Gortner, R. A., Jr., 419.
 Gorton, W. W., 549, 832.
 Goss, H., 94, 232, 384, 520.
 Goss, L. W., 107.
 Goss, R. W., 775.
 Gottlieb, R., 715.
 Gould, B. S., 596.
 Gould, E., 794.
 Gould, I. A., 524.
 Gourley, J. H., 480.
 Gowen, J. W., 205, 247, 747.
 Graber, L. F., 339.
 Grace, N. H., 26, 318, 354, 453, 598.
 Graham, E., 724.
 Graham, E. R., 15, 310.
 Graham, L. T., 640.
 Graham, N. P. H., 109.
 Graham, R., 109, 540.
 Graham, T. W., 42, 65, 74.
 Grainger, J., 207, 322.
 Grandfield, C. O., 40, 339, 732.
 Grandstaff, J. O., 142.
 Graner, E. A., 326.
 Granovsky, A. A., 643.
 Grant, F. M., 104.
 Grant, T. J., 78.
 Grantham, J. B., 204.
 Gratz, L. O., 629.
 Graves, E. M., 769.
 Graves, R. R., 39, 239.
 Gray, E., 539.
 Gray, E. G., 363.
 Gray, E. L., 700.
 Gray, H. F., 647.
 Gray, K. W., 790, 791.
 Gray, P., 603.
 Gray, P. H. H., 326.
 Gray, R. A., 555.
 Gray, R. E., 93.
 Grayson, J. M., 220.
 Greaney, F. J., 360.
 Greathouse, G. A., 25, 439.
 Greathouse, L. H., 619.
 Greaves, J. E., 16, 166, 252, 851.
 Green, E. L., 328.
 Green, R. G., 672.
 Green, W. P., 546.
 Green, W. W., 327.
 Greenberg, D. M., 417, 695.
 Greenberg, L. A., 850.
 Greene, J. W., 5.
 Greene, P. S., 716, 717.
 Greene, R. R., 37, 331, 606, 749.
 Greenfield, J. G., 856.
 Greenfield, S. S., 169, 745.
 Greenlaw, J. P., 555, 842.
 Greenlie, D., 706.
 Greenslade, R. M., 376.
 Greenway, P. J., 23.
 Greenwood, A. W., 652.
 Greenwood, D. E., 507.
 Greenwood, J. H., 713.
 Greep, R. O., 603.
 Greer, S. R., 353.
 Gregory, C. L., 689, 841.
 Gregory, P. H., 370, 771.
 Gregory, R. W., 121.
 Gregson, J. D., 374.
 Greis, H., 211.
 Greve, E. W., 47.
 Grey, C. G., 111.
 Griebel, C., 424, 709.
 Griep, W., 159.
 Griffee, F., 717.
 Griffin, F. L., 121.
 Griffith, F. R., Jr., 715.
 Griffith, M., 386.
 Grigsby, R. M., 829.
 Grigsby, S. E., 266.
 Grimes, F. G., 639.
 Grimes, J. C., 464, 515.
 Grimes, W. E., 117, 267.
 Grimminger, G., 13.
 Grinnells, C. D., 234.
 Grizzard, A. L., 343, 611.
 Groat, R. A., 460.
 Groenewald, J. W., 234.
 Groetsema, F., 750.
 Grogan, R. G., 740.
 Grooshevoy, S. E., 73.
 Gross, P., 703.
 Grossman, A. M., 140.
 Grottoadden, O., 847.
 Grover, F. O., 43.
 Groves, K., 477, 503, 516, 527.
 Gruenhagen, R. H., 488.
 Grunder, M. S., 471, 503, 542.
 Grundmann, A. W., 511.
 Grushevoi, S. E., 73.
 Gryse, J. J. de, 390.
 Guard, W. F., 107.
 Guba, E. F., 769.
 Gudkov, A. N., 456.
 Guerrant, N. B., 277, 656.
 Guerrant, R. E., 851.
 Guest, P. L., 190, 204.
 Guha, B. C., 123, 425.
 Guilbert, H. E., 94.
 Guin, M., 410, 550, 552.
 Guin, P. W., 386.
 Gullickson, T. W., 391, 519.
 Gundersen, A., 170.
 Gunderson, H., 640.
 Gunn, D. L., 81.
 Guinness, C. I., 823.
 Gunsalus, I. C., 33.
 Gupta, S. N. Das, 370.
 Gurney, A. B., 87.
 Gustafson, A. F., 20.
 Gustafson, F. G., 349, 740.
 Guthrie, E. S., 521, 524, 659.
 Guthrie, J. E., 114, 674.
 Gutowska, M. S., 804, 806.
 Gutteridge, H. S., 654.
 Gwatkin, R., 404, 671, 824.
 Gwin, J. M., 718.
 György, P., 134, 569.
 Haag, H. M., 688, 835.
 Haag, J. R., 245, 801.
 Haagen-Smit, A. J., 741.
 Haas, A. B. C., 16, 483.
 Haas, H. F., 461.
 Haas, H. J., 40.
 Haber, E. S., 151, 190, 192.
 Habermann, R. T., 403.
 Hackedorn, H., 516, 576.
 Haddow, A. J., 790.
 Hadjinalao, J., 510.
 Hadley, C. H., 227.
 Hadwen, S., 108.
 Haenseler, C. M., 204, 480.
 Haffen, E., 604.
 Hafner, F. H., 93.
 Hageman, P. O., 105.
 Hageman, R. H., 484.
 Haggard, H. W., 850.
 Hahn, A. J., 102.
 Hahn, G. G., 64, 204.
 Hahn, P. F., 418, 551.
 Haig, C., 132.
 Haig, I. T., 625.
 Haines, W. C., 13.
 Haines, W. T., 233.
 Hale, J. K., 557.
 Hale, W. S., 237.
 Hall, A. J., 281.
 Hall, D. G., 502.
 Hall, E. E., 42.
 Hall, J. L., 92.
 Hall, R. A., 385.
 Hall, R. P., 784.
 Hall, S. A., 246, 521.
 Hall, W. L., 152.
 Haller, H. L., 87.
 Haller, H. S., 104.
 Haller, M. H., 54, 621.
 Hallman, L., 559, 560.
 Hallsted, A. L., 40.
 Halma, F. F., 77, 353.
 Halnan, E. T., 381.
 Halpin, J. G., 236, 516, 807.
 Halverson, W. V., 815.
 Halverson, H. W., 676.
 Hamalainen, C., 531.
 Hamann, E. E., 530.
 Hambidge, G., 356.
 Hamblin, I. E., 430, 448, 470, 545.
 Hamburger, V., 603, 605.
 Hamerstrom, F. N., Jr., 405.
 Hamilton, A. B., 551.
 Hamilton, C. C., 515.
 Hamilton, C. M., 466, 539.
 Hamilton, D. W., 376.

- Hamilton, H. L., 603, 641.
 Hamilton, J. B., 603.
 Hamilton, J. D., 141.
 Hamilton, J. G., 271.
 Hamilton, J. M., 365, 690.
 Hamilton, T. S., 233.
 Hamilton, W. J., Jr., 783.
 Hammar, H. E., 313.
 Hammer, B. W., 33, 102, 238, 394.
 Hammer, O. H., 375.
 Hammerly, D., 381.
 Hammond, G. H., 785.
 Hammond, J., 604.
 Hammond, J. C., 390, 807.
 Hammond, M. E., 604.
 Hamre, C. J., 439.
 Hancock, N. I., 210, 470.
 Hand, D. B., 524, 659.
 Hand, I. F., 308.
 Hankins, O. G., 382.
 Hankinson, C. L., 659.
 Hanna, G. C., 845.
 Hansard, S. L., 520.
 Hansberry, R., 221, 793.
 Hansen, A. E., 666.
 Hansen, E., 201.
 Hansen, E. N., 176, 238.
 Hansen, H. C., 809.
 Hansen, H. N., 371.
 Hansen, H. P., 24, 588.
 Hansen, P. A., 394.
 Hanson, A. M., 32.
 Hanson, H. C., 238.
 Hanson, P. D., 64.
 Hanson, R. L., 520.
 Hansson, A., 392.
 Hanzal, R. F., 96.
 Hardenbergh, J. G., 524.
 Hardenburg, E. V., 476.
 Hardesty, T. C., 431.
 Harding, A. M., 287.
 Harding, P. L., 58, 131.
 Hardison, J. R., 64.
 Hardman, G., 542.
 Hardy, J. I., 639.
 Hardy, M. B., 59.
 Hardy, W. T., 535.
 Haring, C. M., 533, 817.
 Harland, H., 521.
 Harman, M. T., 125.
 Harman, S. W., 507.
 Harmer, P. M., 592.
 Harmon, F. N., 197.
 Harmon, L. G., 726.
 Harmon, S. W., 375.
 Harms, A., 96.
 Harmsen, G. W., 734.
 Harmston, F. C., 217.
 Harper, H. A., 564.
 Harper, H. J., 309, 615, 616.
 Harper, W. G., 303.
 Harrar, J. G., 720.
 Harrell, D. C., 42.
 Harrell, F. M., 42.
 Harries, F. H., 501.
 Harrington, C. D., 791.
 Harrington, F. M., 757.
 Harrington, G. E., 491.
 Harrington, J. F., 193.
 Harris, F. B., 338.
 Harris, G. H., 763.
 Harris, H. A., 216.
 Harris, H. C., 13.
 Harris, H. M., 790.
 Harris, J. S., 726.
 Harris, L. J., 571.
 Harris, M., 282.
 Harris, R. G., 33.
 Harris, R. H., 47, 70, 286, 476, 506.
 Harris, R. S., 706.
 Harris, S. C., 37.
 Harris, T. H., 373.
 Harrison, A. L., 778.
 Harrison, D. C., 697.
 Harrison, J., 811, 814.
 Harrison, P. K., 222.
 Harrison, T. B., 521.
 Harshaw, H. M., 237.
 Harshfield, G. S., 541.
 Hart, E. B., 100, 413, 432, 522, 582, 583, 673, 699, 804.
 Hart, F. P., 375.
 Hart, G. H., 94, 112, 394, 529, 650.
 Hart, V. B., 121.
 Harter, L. L., 358, 773.
 Hartley, C., 630.
 Hartley, C. W. S., 517.
 Hartman, A. M., 519.
 Hartman, E. L., 484.
 Hartman, G. H., 242.
 Hartman, H., 201.
 Hartman, J. D., 349.
 Hartman, L., 427.
 Hartmann, H. T., 771.
 Hartsell, S. E., 404.
 Hartung, M. E., 190.
 Hartwig, E. E., 602.
 Hartzell, A., 456.
 Hartzell, F. Z., 375.
 Harvey, P. C., 398.
 Harvey, R. B., 315.
 Harvey, W. A., 471.
 Harvey, W. C., 375.
 Harwood, P. D., 106, 114, 403, 825.
 Haseman, L., 378.
 Haskell, R. J., 360.
 Hastings, E., 646.
 Hastings, E. B., 507.
 Hastings, E. G., 720.
 Hastings, R. J., 211.
 Hastings, W. T., 804.
 Hatch, M. H., 218.
 Hatfield, D. M., 500, 640.
 Hathaway, M. L., 861.
 Haultain, W. F. T., 139.
 Hauser, E. R., 105.
 Hausman, L. A., 783.
 Havis, A. L., 482, 484.
 Hawk, V. B., 471.
 Hawkins, A., 609.
 Hawkins, B. S., 65.
 Hawkins, J. H., 217, 642.
 Hawkins, R. S., 286, 717.
 Hawk, E. R., 286.
 Hawley, I. M., 90.
 Hawthorne, L. R., 51.
 Hawthorne, P. L., 762.
 Hay, D. G., 842.
 Hay, J. R., 107, 635.
 Hay, R. C., 448.
 Haydak, M. H., 228, 648.
 Hayden, A., 170, 171.
 Hayden, C. E., 527.
 Hayes, F. A., 432.
 Hayes, G. L., 63.
 Hayes, H. K., 174.
 Hayes, W. J., 843.
 Hayes, W. P., 375.
 Hayne, D. W., 783.
 Haynes, J. L., 302, 733.
 Haynes, W. C., 719.
 Hays, F. A., 35, 329, 466, 804.
 Hays, O. E., 446.
 Hayward, H. E., 169.
 Hayward, J. W., 93.
 Hayward, K. J., 89.
 Hazen, A. G., 718.
 Hazen, N. W., 679.
 Hazlewood, B. P., 470, 516, 521.
 Headington, R. C., 719.
 Headlee, T. J., 500.
 Headley, F. B., 238, 472, 516.
 Heald, F. D., 487, 720.
 Heathman, W., 519.
 Hebert, T. T., 768.
 Hedden, O. K., 261.
 Hedgcock, G. G., 357.
 Hedlund, G. W., 288.
 Hedström, H., 674.
 Heegaard, E., 441.
 Heggeness, H. G., 204.
 Heggeness, O. A., 186.
 Hegner, R., 828.
 Hegsted, D. M., 651, 804.
 Heizer, E. E., 327.
 Helgeson, E. A., 476.
 Hellebust, A. L., 842.
 Heller, E., 478.
 Heller, G., 461.
 Heller, V. G., 484.
 Hollman, L. M., 713.
 Helser, M. D., 176, 231.
 Hemphill, P. V., 839.
 Hendee, E. C., 174.
 Hender, R. C., 569.
 Hendershott, R. A., 524.
 Henderson, C. F., 649.
 Henderson, E. W., 467, 469, 653.
 Henderson, H. B., 521.
 Henderson, H. L., 259.
 Henderson, H. O., 660.
 Henderson, J. L., 394, 521, 811.
 Henderson, J. R., 589.
 Henderson, L. F., 315.

- Henderson, M., 388
 Henderson, M. D., 272, 273.
 Hendricks, J. B., 573.
 Hendricks, S. B., 437.
 Hendrickson, G. O., 217, 409.
 Henke, L. A., 231, 238
 Hennig, K., 570.
 Henrie, R. L., 95.
 Hepner, F. E., 13.
 Hepting, G. H., 79, 372.
 Herman, C. M., 827.
 Herman, H. A., 330, 519, 657.
 Herreid, E. O., 526.
 Herrick, C. A., 236, 516
 Herrington, B. L., 158.
 Hershey, L. B., 2
 Hertel, J. P., 407.
 Hertel, K. L., 470.
 Hertwig, P., 329.
 Hervey, R. J., 166
 Herzer, F. H., 523.
 Hess, A. D., 511.
 Hess, C. W., 406.
 Hess, G., 424, 709.
 Hess, J. H., 562.
 Hess, W. C., 234.
 Hesse, A. J., 85.
 Hetrick, L. A., 799.
 Hetzer, H. O., 327.
 Heuser, G. F., 390, 805.
 Heuser, J. F., 542.
 Hewetson, F. N., 602.
 Hewitt, R., 404.
 Heyne, E. G., 40, 65, 84.
 Heywang, B. W., 235.
 Hibbard, A. D., 595.
 Hibbard, B. H., 680.
 Hibbard, R. P., 24.
 Hibbert, H., 361.
 Hibbs, J. W., 519.
 Hickman, C. W., 800, 802.
 Hide, J. C., 13, 304.
 Hinton, T. E., 52, 144.
 Hier, S. W., 804.
 Higbee, E., 603.
 Higgins, B. B., 175, 725, 728, 757.
 Higgins, L. J., 46.
 Hightower, D. P., 130.
 Hilborn, M. T., 620.
 Hildebrand, A. A., 636.
 Hildebrand, E. M., 76, 204, 215, 635.
 Hileman, J. L., 394, 520, 525
 Hilgeman, R. H., 57, 198.
 Hilgendorf, F. W., 337.
 Hill, A. B., 101.
 Hill, A. V., 214.
 Hill, E. B., 833.
 Hill, G. W., 689.
 Hill, H., 375.
 Hill, H. O., 604.
 Hill, J. A., 143.
 Hill, L. M., 774.
 Hill, M. L., 681.
 Hill, R. C., 121.
 Hill, R. T., 334.
 Hill, S. O., 641
 Hill, W. C., 381
 Hillary, B. B., 30, 746
 Hillier, J., 174.
 Hillier, J. C., 382.
 Hilton, J. E., 519, 865.
 Himsworth, H. P., 711.
 Hinchcliff, K. H., 287.
 Hinkle, D. A., 756.
 Hinman, W. S., 12.
 Hinchshaw, W. R., 406, 664, 818.
 Hinton, H. E., 380.
 Hirato, K., 528.
 Hirschhorn, E., 490.
 Hirt, R. R., 80.
 Hitchcock, A. E., 170.
 Hitchner, E. R., 32.
 Hixon, R. M., 151, 185.
 Hixson, E., 224.
 Hlynka, L., 662.
 Ho, W.-C., 772.
 Hoagland, D. R., 20, 453, 737, 778.
 Hoard, W. D., 522.
 Hobbs, C. H., 64.
 Hoblyn, T. N., 351.
 Hobson, R. P., 648.
 Hochmuth, H. R., 549.
 Hock, C. W., 282, 355.
 Hockey, J. F., 75.
 Hodde, W. L., 142.
 Hodes, S. S., 404.
 Hodge, H. C., 562, 697.
 Hodgen, W. R., 740.
 Hodges, E. M., 181, 190.
 Hodges, J. A., 117.
 Hodgson, B. E., 789.
 Hodgson, R. E., 238, 521.
 Hodgson, R. W., 58, 483, 484.
 Hodson, A. C., 644.
 Hodson, A. Z., 274, 857.
 Hofer, A. W., 38.
 Hofer, G. N., 356.
 Hoffman, F. G., 468.
 Hoffman, G. W., 839.
 Hoffman, H. A., 253.
 Hoffman, J. C., 347.
 Hoffman, W. A., 82.
 Hoffmann, C. H., 227.
 Hoffmann, O., 443.:
 Hoffsommer, H., 266, 829.
 Hofmann, F. W., 175.
 Hofsten, E. von, 841.
 Hogan, A. G., 96, 382, 674, 851.
 Hogg, P., 471.
 Hogg, P. G., 288.
 Holben, F. J., 754.
 Holdaway, C. W., 520, 523.
 Holdaway, F. G., 218.
 Hollaender, A., 169.
 Holland, R. F., 524.
 Hollander, F., 37, 749.
 Hollands, H. F., 548.
 Hollembeak, H. D., 45.
 Holley, K. T., 725, 728, 757.
 Hollingsworth, H., 284.
 Holm, G. C., 815.
 Holm, G. E., 520.
 Holmes, C. E., 286, 516, 720.
 Holmes, R. S., 162.
 Holsoe, T., 63.
 Holt, A. L., 674.
 Holt, D. E., 446, 471.
 Holt, W. L., 252.
 Holtan, H. N., 302.
 Holton, C. S., 358, 487, 491, 768.
 Holton, E. L., 267.
 Holubinsky, I. N., 459.
 Holway, R. T., 790.
 Holzapfel, L., 68.
 Holzman, B., 302.
 Hood, E. G., 662.
 Hooker, C. W., 38, 469, 603.
 Hoon, R. C., 738.
 Hoos, S., 681, 682.
 Hoover, C. D., 470.
 Hoover, S. R., 317.
 Hopkins, J. A., 262.
 Hopkins, J. W., 302.
 Hoop, H., 62, 203.
 Hooppe, P. E., 204, 503.
 Hopperstead, S. L., 65, 365, 366, 778.
 Hopson, R. E., 159.
 Horlacher, L. J., 381.
 Horlacher, W. R., 653.
 Horn, C. L., 595.
 Horne, W. T., 497.
 Horner, G. M., 445.
 Horrall, B. E., 520.
 Horstall, F. L., Jr., 398.
 Horstall, J. G., 64.
 Horton, R. E., 164, 302, 732.
 Horwood, R. E., 657.
 Hosaka, E. Y., 181.
 Hoskins, W. H., 38.
 Hosoda, T., 528.
 Hotchkiss, A., 269.
 Hotchkiss, R. D., 249, 250, 251.
 Hough, G. J., 14.
 Houser, J. S., 503, 643.
 Houston, M. H., 862.
 Hove, E., 582, 583.
 Hoveland, N., 575.
 How, J. E., 601.
 Howard, F. L., 61.
 Howard, L., 375.
 Howe, H., 117.
 Howe, P. E., 234, 382.
 Howe, P. R., 93.
 Howell, C. E., 112.
 Howell, D. E., 532, 815.
 Howell, L. D., 834.
 Howitt, R., 254.
 Howlett, F. M., 480.
 Howson, R. K., 524.
 Hoyle, R. J., 259.
 Hsu, P. C., 412.
 Hubbard, L. H., 130.
 Hubbard, M. E., 710.

- Hubbert, M. K., 302.
 Huber, G. A., 477, 478, 487, 488, 503, 770.
 Huber, L. L., 795.
 Huberty, M. R., 732.
 Hubricht, L., 451.
 Hucker, G. J., 108, 174, 260.
 Huddleson, I. F., 253, 530.
 Hudson, C. B., 538.
 Hudson, N. P., 252.
 Huelin, F. E., 353.
 Huff, A. J., 550.
 Huff, N. E., 421.
 Huffaker, C. B., 217.
 Huffman, C. F., 241, 392, 519.
 Huggins, R. A., 500.
 Huggins, S. E., 500.
 Hughes, C. W., 735.
 Hughes, E. H., 382, 860.
 Hughes, E. M., 837.
 Hughes, H. I., 160, 182, 185.
 Hughes, J. S., 92, 94, 98, 382, 583, 803.
 Hughes, O., 207.
 Hughes, T., 689.
 Hukill, W. V., 546.
 Hulburt, W. C., 287.
 Hull, F. E., 109.
 Hull, F. H., 475, 608.
 Hull, H. H., 446, 522.
 Hultz, F. S., 95.
 Hume, E. P., 199.
 Humfeld, H., 283.
 Hummel, F. C., 562.
 Humphrey, E. N., 828.
 Humphries, W. R., 545.
 Hungerford, C. W., 864.
 Hungerford, T. G., 405.
 Hünlich, R., 281.
 Hunn, C. J., 576.
 Hunsaker, H., 731.
 Hunscher, H. A., 562.
 Hunt, H. R., 605.
 Hunt, M. L., 489.
 Hunt, W. H., 403.
 Hunter, A. C., 156.
 Hunter, E. D., 830.
 Hunter, G. J. E., 813.
 Huntington, E., 844.
 Hurd, E. B., 548.
 Hurdis, J. W., 752.
 Hurlbut, H. S., 797.
 Hurst, L. A., 450.
 Hurst, V., 519.
 Hurst, W. M., 59.
 Hurt, R. E., 637.
 Husain, M. A., 88, 644, 645.
 Hussein, A. A., 295, 301.
 Hussong, R. V., 394.
 Hutcheson, T. B., 611, 616.
 Hutchins, H. L., 362.
 Hutchinson, R. C., 101.
 Hutchinson, C. B., 143.
 Hutson, R., 225, 621.
 Hutt, F. B., 329, 748.
 Hutton, E. M., 525.
 Hyland, F., 170, 325, 623.
 Hylander, C. J., 314.
 Hyre, R. A., 620.
 Ihlen, H. L., 92.
 Idnani, J. A., 538.
 Ikeda, W., 190.
 Immelman, M. N. S., 85.
 Immer, F. R., 144.
 Ingle, J. D., 394.
 Ingraham, A. S., 653.
 Inui, E., 160.
 Innes, W. B., 437.
 Insko, W. M., Jr., 90.
 Irwin, M. R., 179, 746.
 Isaac, W. E., 478.
 Isaacs, M. L., 32, 658.
 Isaacs, R., 694.
 Isbell, C. L., 470.
 Isely, D., 502.
 Ishii, S., 529.
 Itikawa, O., 528.
 Ittner, N. R., 112, 382.
 Itzerott, A. G. F., 396.
 Ivanoff, S. S., 779.
 Ivanov, V. I., 462.
 Iverson, V. E., 73, 211, 757.
 Ives, R. L., 740.
 Ivlev, V. S., 324.
 Ivy, A. C., 749.
 Iyer, S. G., 114.
 Jaap, R. G., 883, 653, 748.
 Jack, E. L., 103.
 Jack, W. B., 26.
 Jackson, F. H., 732.
 Jackson, H., 842.
 Jackson, L. E., 121.
 Jackson, M. L., 305.
 Jacob, F. H., 641.
 Jacob, K. D., 21.
 Jacob, W. C., 48.
 Jacobsen, D. H., 144.
 Jacobson, L., 350.
 Jacquot, H. D., 471.
 Jagger, I. C., 50.
 Jahn, T. L., 784.
 James, M. T., 510.
 James, N., 18.
 Jamieson, C. A., 88, 798.
 Jamieson, G. S., 294.
 Jamison, F. S., 608, 619.
 Janer, J. L., 82.
 Jankelson, I. R., 421.
 Janse, A. J. T., 85.
 Jaques, H. E., 641.
 Jardine, J. T., 286.
 Jarl, F., 99, 655.
 Jary, S. G., 206.
 Jawetz, E., 400.
 Jayaratnam, T. J., 515.
 Jaynes, H. A., 229.
 Jefferies, J. H., 619.
 Jeffers, W. F., 368.
 Jefferson, C. H., 261.
 Jeffrey, F. P., 237, 467, 518, 804, 805.
 Jeghers, H., 394, 414.
 Jenkins, A. E., 206, 371, 488.
 Jenkins, E. W., 764.
 Jenkins, G. L., 174.
 Jenkins, J. M., 122, 752, 864.
 Jenkins, J. M., Jr., 48.
 Jenkins, W. A., 570, 765, 768, 772.
 Jenkins, W. H., 42.
 Jennings, H. S., 784.
 Jenovese, J. F., 424.
 Jensen, C., 343.
 Jensen, E., 670.
 Jensen, H. L., 452.
 Jensen, J. H., 494, 775.
 Jensen, J. M., 676.
 Jensen, O. G., 520, 658.
 Jensen, T. M., 662.
 Jenness, O. B., 839.
 Jewett, H. H., 645.
 Joachim, A. W. R., 570.
 Jodon, N. E., 122, 752.
 Joffe, J. S., 307, 310, 480.
 Johannsen, O. A., 83.
 Johansen, G., 317.
 Johansson, I., 392.
 Johns, C. K., 396, 524, 658.
 Johns, D. M., 45, 752, 864.
 Johnson, A. A., 185.
 Johnson, A. J., 545.
 Johnson, B. C., 241, 651.
 Johnson, C. G., 641.
 Johnson, D. L., 788.
 Johnson, E. A., 398.
 Johnson, E. C., 575.
 Johnson, E. L., 728.
 Johnson, E. M., 364.
 Johnson, E. P., 540.
 Johnson, F., 630.
 Johnson, F. A., 718.
 Johnson, F. H., 82.
 Johnson, G., 556, 641, 846.
 Johnson, G. T., 25, 315.
 Johnson, G. V., 501.
 Johnson, H. B., 843.
 Johnson, H. W., 210, 821.
 Johnson, I. J., 402.
 Johnson, J., 472, 488, 770.
 Johnson, J. A., 500.
 Johnson, J. P., 379.
 Johnson, M. A., 169.
 Johnson, M. J., 853.
 Johnson, P., 100.
 Johnson, P. E., 850.
 Johnson, R. E., 534.
 Johnson, R. F., 750, 800, 802, 809.
 Johnson, S., 689.
 Johnson, S. D., 665.
 Johnson, S. E., 548.
 Johnson, S. R., 382.
 Johnson, T., 326, 359.
 Johnson, W. E., 159.
 Johnson, W. T., Jr., 246.
 Johnston, A., 382.
 Johnston, C. O., 65, 341, 357, 359.
 Johnston, S., 194, 621.

- Johnstone, G. R., 355.
 Jolivet, J. P., 478, 488, 778.
 Jolliffe, N., 422, 859.
 Jones, D. F., 601.
 Jones, D. P., 647.
 Jones, D. T., 224.
 Jones, E. T., 499.
 Jones, F. R., 471, 771.
 Jones, G. D., 502.
 Jones, H. A., 191, 357.
 Jones, I. R., 238, 245.
 Jones, J. E., 587.
 Jones, J. H., 885.
 Jones, J. M., 35, 382, 385.
 Jones, J. W., 601.
 Jones, L. H., 789, 769.
 Jones, L. K., 487.
 Jones, M. M., 544.
 Jones, O. G., 788.
 Jones, R. E., 176.
 Jones, R. J., 445.
 Jones, R. L., 42, 92, 105.
 Jones, S. C., 86.
 Jones, T. N., 430, 545.
 Jones, W. W., 72, 181, 190, 484, 490.
 Jordan, E. S., 465, 603.
 Jørgensen, H. C., 101.
 Joshi, B. M., 481.
 Joshi, K. G., 14.
 Joshi, R. H., 14.
 Joslyn, M. A., 124, 155, 300.
 Joyner, A. L., 398.
 Judd, B. I., 781.
 Judkins, H. F., 432.
 Jünger, H. W., 40, 45, 84.
 Jukes, T. H., 97, 133, 276, 673, 802, 857.
 Julianelle, L. A., 398.
 Jull, M. A., 468.
 Jungherr, E., 113, 534, 664.
 Junnala, W. A., 116, 719.
 Justice, O. L., 744.
 Justice, R. S., 170.
 Justin, M. M., 121.
 Kadow, K. J., 65, 84, 363, 366, 778.
 Kagy, J. F., 217, 649, 650.
 Kahlenberg, O. J., 569.
 Kahler, H., 420.
 Kahn, M. C., 647.
 Kakavas, J. C., 107.
 Kalaf, A. M., 168, 232.
 Kaliss, N., 746.
 Kalkus, J. W., 575.
 Kalmbach, E. R., 499.
 Kaloostian, G. H., 501.
 Kamat, M. N., 637.
 Kamei, S., 79.
 Kao, H. C., 565.
 Kapur, H. R., 826.
 Karasawa, S., 528.
 Kardos, L. T., 445, 477.
 Kark, R., 19, 715.
 Karlson, A. G., 105, 254, 401, 920.
 Karmarkar, D. V., 481.
 Karpechenko, G. D., 402.
 Karraker, P. E., 21.
 Karrer, P., 440, 443, 714.
 Kasai, K., 528.
 Kasparian, A. S., 327, 464.
 Kass, J. P., 294, 295.
 Kassan, R. J., 9.
 Kassner, E. W., 710.
 Kates, K. C., 824.
 Kato, K., 715.
 Kato, S., 529.
 Katz, J. S., 817.
 Katznelson, H., 19, 396.
 Kauffman, F., 666.
 Kaup, D. H., 713.
 Kausche, G. A., 68.
 Kavanaugh, J. N., 472.
 Kawahara, Y., 529.
 Kawamura, E., 206.
 Kearney, T. H., 170.
 Kearns, C. W., 507, 797.
 Kebreau, F., 497.
 Keck, W. N., 641.
 Kehoe, R. A., 698.
 Kelles, E. O., 698.
 Keith, T. B., 95, 386, 503.
 Keitt, G. W., 75, 496, 779.
 Kelbert, D. G. A., 589, 619, 629.
 Keller, M., 136.
 Keller, W., 613.
 Keller, W. B., 65.
 Kelley, A. P., 24.
 Kelley, O. B., 139.
 Kelley, R. B., 464.
 Kelley, V. W., 635.
 Kelley, W. P., 161.
 Kellogg, C. E., 161, 639.
 Kelly, C. F., 546.
 Kelly, E., 567, 700.
 Kelly, H. C., 73, 211.
 Kelly, J. T., 168.
 Kelly, J. W., 170.
 Kelly, M. D., 820.
 Kemmerer, A. R., 152.
 Kemp, M., 524.
 Kemp, W. B., 192.
 Kempster, H. L., 96, 388, 674.
 Kempton, J. H., 741, 746.
 Kendall, B., 603.
 Kendrick, J. F., 518.
 Kennard, D. C., 518, 547, 805, 808.
 Kennedy, A. L., 542.
 Kennedy, J. S., 226.
 Kennedy, R. R., 303.
 Kent, G. C., 205.
 Kenworthy, A. L., 477, 487.
 Kernkamp, H. C. H., 110, 664.
 Kernkamp, M. F., 68, 771.
 Kerr, T., 31.
 Kerr, T. W., Jr., 791.
 Kerschbaum, E., 606.
 Kersten, H., 745.
 Kertész, Z. I., 155, 437, 561, 850.
 Kevorkian, A. G., 78, 432.
 Khan, M. A. W., 645.
 Khudyna, I. P., 73, 74.
 Kibler, H. H., 801.
 Kidder, G. W., 784.
 Kidder, R. W., 604, 608, 651.
 Kienholz, R., 766.
 Kiesselbach, T. A., 614.
 Kightlinger, C. V., 769.
 Kikuta, K., 204.
 Killinger, G. B., 42.
 Kimura, T. T., 268.
 Kinard, J. D., 118.
 Kincaid, R. R., 74, 608, 620.
 Kindschi, C. J., 471.
 King, C. G., 861.
 King, D. F., 515, 547.
 King, F. B., 122.
 King, H. D., 747.
 King, H. H., 738.
 King, J. D., 424.
 King, J. R., 84.
 King, R. H., 865.
 King, R. L., 641, 784.
 King, W. A., 241, 516, 522.
 Kinney, E. J., 364.
 Kiplinger, D. C., 200, 484, 781.
 Kirby, H., Jr., 784.
 Kirk, M. M., 134.
 Kirk, W. G., 604, 651.
 Kirkham, D., 302.
 Kirschbaum, A., 608.
 Kiser, O. M., 382.
 Kisselova, V. V., 73.
 Kitzelman, C. H., 104.
 Kittredge, J., 302, 586, 782.
 Klages, K. H., 724, 750.
 Klaus, H., 210.
 Kleckner, A. L., 534.
 Kleedorfer, A., 603.
 Kleiber, M., 240, 271, 382, 417.
 Kirby, J. R., 859.
 Klein, L. A., 534.
 Klem, M. C., 284.
 Klumpner, E., 37, 749.
 Klimochkina, L. V., 463.
 Kline, E. K., 174.
 Kline, O. L., 152.
 Klose, A. A., 252, 574.
 Klotz, L. J., 369, 497, 781, 791.
 Knapp, H. B., 121.
 Knapp, J. O., 689.
 Knappen, P., 499.
 Knaysal, G., 32.
 Kneen, E., 343.
 Kniaginichev, M. I., 453.
 Knight, C. A., 277, 656.
 Knight, D. B., 640.
 Knight, H. L., 286.
 Knight, R. E., 750, 769.
 Knippling, E. F., 511.
 Knoblauch, H. C., 302, 733.
 Knodt, C. B., 519.
 Knott, J. C., 238, 521.
 Knott, J. E., 620.
 Knowles, D., 268, 850.

- Knowles, D. M., 847.
 Knowlton, G. F., 217, 502, 642, 645, 784.
 Knowlton, K. R., 197.
 Knudsen, H. V., 102.
 Knudsen, L. F., 442.
 Knudsen, S., 102.
 Knutson, H., 88.
 Koch, E. M., 236.
 Koch, F. C., 236, 600.
 Koch, L. W., 495.
 Kochakian, C. D., 331.
 Kodicek, M., 858.
 Koehler, B., 44, 360, 361.
 Koehn, C. J., 523.
 Kofold, C. A., 784.
 Kohlemann, E., 707.
 Kohler, G. O., 272.
 Kohler, J. P., 589.
 Kohnmeyer, J. B., 830.
 Kohnmeyer, W., 865.
 Kohls, G. M., 381, 640, 648.
 Kohls, H. L., 615.
 Kohn, H. I., 859.
 Kohn, R., 635.
 Kohnke, H., 164, 485.
 Koldsumi, K., 790, 798.
 Kolachov, P., 33.
 Koller, E. F., 839.
 Kollmorgen, W. M., 843.
 Kolodny, L., 307.
 Kon, S. K., 100, 601.
 Kong, 231.
 Kong, R. W., 304.
 Koolish, A. I., 74.
 Koonz, C. H., 382.
 Kopitke, J. C., 766.
 Koser, S. A., 397, 398, 818.
 Kosin, I. L., 654.
 Kotok, E. L., 12.
 Koura, T. F., 80.
 Koutz, F. B., 105.
 Kovachevsky, I. C., 361.
 Kovalev, N. V., 75.
 Kraehenbuehl, J. O., 523.
 Kraenzel, C. F., 830.
 Krainev, S. I., 456.
 Krajan, A. A., 30.
 Krakower, C., 574.
 Kramer, A., 622.
 Kramer, M., 213.
 Kramer, P. J., 172, 743.
 Kraneveld, F. C., 537.
 Kraucunas, P., 293.
 Kraus, E. J., 320.
 Kraus, J. E., 762.
 Krauss, W., 141.
 Krauss, W. E., 519.
 Kraybill, H. R., 144, 382, 735, 761.
 Kregg, K. K., 372.
 Kreisinger, E. J., 471.
 Kreke, C. W., 359, 740.
 Kremer, J. C., 479.
 Kremers, M. Y., 568.
 Kreutzer, W. A., 362.
 Krezinger, E. J., 720.
 Kriegel, M. W., 814.
 Krieger, C. H., 279, 280.
 Krill, W. R., 719.
 Kringstad, H., 704.
 Krishna Ayyar, P. N., 515, 645.
 Krishnamurthy, P. V., 705.
 Krishnaswamy, N., 30.
 Kriss, M., 383.
 Krizenecky, J., 240.
 Kroeber, J. K., 498.
 Kroner, T. D., 287.
 Kroulik, J. T., 592.
 Kruse, H. D., 858.
 Kubota, H., 484.
 Kubota, K., 798.
 Kucinski, K. J., 729, 752.
 Kudelka, O., 811.
 Kuether, C. A., 852.
 Kugelmass, I. N., 141, 574.
 Kuhlman, A. H., 391, 520.
 Kulish, A. I., 74.
 Kulp, M. R., 828.
 Kumlien, W. F., 690.
 Kummer, F. A., 542.
 Kunsman, C. H., 22.
 Kurihara, Y., 529.
 Kurland, A. A., 332.
 Kurssanov, A. L., 173.
 Kuska, J. B., 40.
 Kuykendall, B., 336, 470.
 Kuzmeski, J. W., 809.
 Kyle, E. J., 553.
 Kyrk, H., 862.
 Kyzer, E. D., 42, 92, 105.
 Lachman, W. H., 762.
 Lackman, D. B., 174, 326.
 Lacroix, D. S., 786.
 Ladejinsky, W. I., 679.
 Lafferty, J. E. H., 117.
 LaFollette, J. R., 374.
 LaForge, F. B., 585.
 Lagasse, F. S., 619.
 Lague, S. B., 865.
 Lahr, E. L., 603, 605.
 Lakin, H. W., 314.
 Lakshminarayan Rao, M. V., 814.
 Lamanna, C., 595.
 Lamar, J. K., 603.
 LaMaster, J. P., 98.
 Lamb, M., 864.
 Lamb, W. II., 691.
 Lambert, E. B., 66, 620.
 Lambert, E., 86.
 Lambert, W. V., 35.
 Lambeth, E. C., 32.
 Lamerson, P. G., 84.
 Lampen, J. O., 326.
 Lampert, L. M., 659, 811.
 Lampman, C. E., 724, 800, 815.
 Landauer, W., 36, 332.
 Landis, P. H., 840.
 Landsberg, H., 585.
 Landy, M., 32.
 Lane, C. B., 238.
 Lane, C. E., 180, 603.
 Lane, M. C., 503, 513.
 Lang, A. L., 44.
 Lang, W. A., 587.
 Langdon, L. M., 169.
 Lange, W. H., Jr., 502.
 Langford, G. S., 511, 791.
 Langford, M. H., 75.
 Langham, D. G., 745.
 Langner, F. W., 106.
 Langner, P. H., Jr., 106.
 Lantz, H. L., 190.
 Lardy, H. A., 178, 468, 520, 749.
 Large, E. C., 628.
 Large, J. B., 768.
 La Rivero, I., 217.
 Larson, A. L., 677.
 Larson, C. A., 471.
 Larson, H. W., 695.
 Larson, R. E., 50.
 Larson, R. H., 488, 773.
 Larter, L. N. H., 66.
 Laskaris, T., 67, 370, 638.
 Lasley, J. F., 327.
 Latham, E. E., 14, 164.
 Lathrop, F. H., 642.
 Latimer, H. B., 466.
 Latimer, L. P., 365.
 Latta, R., 501.
 Laubscher, F. X., 85.
 Laude, H. H., 40, 189.
 Laude, H. M., 718.
 Lauffer, M. A., 71, 212.
 Lauprecht, E., 240.
 Laurie, A., 344, 484, 781.
 LaVol, D. H., 382.
 Lavoipierre, M. M. J., 85.
 Law, A. G., 720.
 Law, L. W., 330.
 Lawless, W. W., 619.
 Lawrence, R. F., 85.
 Lawrence, W. E., 315.
 Lawson, B. C., 121.
 Lawson, F. R., 501.
 Lea, D. E., 358.
 Leach, B. E., 819.
 Leach, L. D., 494.
 Leach, R., 368, 497.
 Leach, R. E., 174.
 Leager, M. C., 553.
 Leamer, R. W., 306.
 Lease, E. J., 3, 48, 98, 105, 236.
 Leasure, E. E., 104.
 Leatham, J. H., 37, 603.
 Leavenworth, C. S., 292.
 Leavenworth, W. C., 176.
 LeBeau, F. J., 488.
 Lebedeva, T. A., 173.
 Leber, H., 525.
 Lechycka, M., 584.
 LeClerc, E. L., 67.
 LeCompte, S. B., Jr., 759, 760.
 Ledehoer, M., 353.
 Lederer, L. G., 851.

- LeDuc, P. W., 664
 Lee, A., 286
 Lee, A. M., 109.
 Lee, C. D., 231, 247.
 Lee, F. A., 153, 346.
 Lee, R. C., 385.
 Leech, W. D., 741.
 Leedy, D. L., 82.
 Lefebvre, C. L., 210.
 Lebane, J. J., 591.
 Lehman, S. G., 768.
 Lehmann, E., 171.
 Lehmann, E. W., 448.
 Lehmann, R. S., 503.
 Lehmann, V. W., 374.
 Lehrbas, M. M., 62.
 Leigh, W. H., 406.
 Leighton, A., 520, 815.
 Lein, J., 480.
 Leiper, J. W. G., 248.
 Leitch, I., 652.
 Leith, B. D., 472.
 Leland, A. W., 665.
 Lemmon, P. M., 477.
 Lemmon, P. G., 471.
 Lennahan, C. M., 13.
 Lennette, E. H., 398.
 Lennox, F. G., 89.
 Lenz, L. W., 372.
 Leonard, A., 559.
 Leonard, E. R., 597.
 Leonard, O. A., 41, 430, 470, 545, 556.
 Leonard, O. E., 740.
 Leonard, S. L., 469.
 Leonard, W. H., 476.
 Leonian, L. H., 169.
 Lepard, O. L., 519, 656.
 Lerner, I. M., 36, 383.
 LeRosen, A. L., 602.
 Lesselbaum, H. R., 627.
 Lesser, M. A., 87.
 Lett, C., 751.
 Lenkel, W. A., 608.
 Le Van, J. H., 797.
 Leveck, H. H., 383, 517.
 Levenstein, I., 330, 603, 604.
 Levine, A. K., 310.
 Levine, A. S., 156, 376, 640, 724, 787.
 Levine, M., 33, 64, 480.
 Levine, P. P., 527, 672.
 Levine, S., 724.
 Levitt, J., 27.
 Levy, E. D., 860.
 Levykh, P. M., 73.
 Lewis, A. A., 333, 391.
 Lewis, C. M., 173.
 Lewis, E. A., 800.
 Lewis, H. B., 419.
 Lewis, H. C., 374.
 Lewis, H. F., 156.
 Lewis, J. C., 455.
 Lewis, J. M., 132.
 Lewis, J. R., 718.
 Lewis, M. R., 164, 194, 732.
 Lewis, R. D., 186.
 Lewis, W. W., 161.
 Lexen, B., 627.
 Leys, J. E., 632.
 Li, C. C., 771.
 Li, C. H., 469, 607.
 Libby, R. L., 398.
 Lillie, F. R., 467, 603.
 Lilly, J. H., 503.
 Lilly, V. G., 169.
 Lima, A. de C., 85.
 Lin, C. K., 207.
 Lindgren, D. L., 222, 223, 785.
 Lindquist, H. G., 809, 812.
 Lindquist, V., 720.
 Lindstrom, E. W., 185, 190, 205, 247.
 Linebaugh, F., 261.
 Linford, M. B., 631.
 Ling, L., 66, 633.
 Lininger, F. F., 689.
 Link, C. B., 62.
 Linke, J. A., 121.
 Linn, M. B., 72.
 Linneboe, J. B., 396.
 Linton, R. W., 248.
 Lipman, C. B., 19, 448.
 Lipman, L. D., 659, 809.
 Lipson, M., 110.
 Lipton, M. A., 274, 297.
 Lisl, A. G., 169.
 Little, C. C., 328.
 Little, E. L., Jr., 170, 355, 486.
 Little, R. B., 250, 251, 524.
 Live, I., 817.
 Livers, J. J., 676.
 Livesay, E. A., 882.
 Livingstone, E. M., 220.
 Llanes, R. M., 322.
 Lloyd, J. W., 46.
 Lochhead, A. G., 19.
 Lochry, H. R., 521.
 Loeb, H. G., 294.
 Loeffel, W. J., 382.
 Loegering, W. Q., 491.
 Loescke, H. W. von, 154.
 Loew, O., 719.
 Loewenstein, F. M., 865.
 Lohwag, K., 81.
 Long, E. M., 169.
 Long, F. L., 316.
 Long, H. F., 33, 102.
 Long, T. E., 261.
 Long, W. H., 767.
 Long, W. S., 499.
 Longenecker, H. E., 861.
 Longley, A. E., 462, 601.
 Longley, L. E., 60, 195, 354.
 Lonsdale, J. T., 151.
 Look, W., 218.
 Loomis, N. H., 197.
 Loomis, W. E., 185, 205.
 Loosli, J. K., 100, 382.
 Lord, F. T., 785.
 Loree, B. E., 622.
 Lorenz, O. A., 633.
 Loucks, K. W., 629.
 Loughary, I. H., 809.
 Loughhead, H. J., 586.
 Louis, L., 268.
 Lounsberry, C. P., 85.
 Love, E. L., 664.
 Love, J. E., 42.
 Love, W. G., 817.
 Lovell, R., 101.
 Lowe, A. E., 40.
 Lowe, B., 231, 268, 845, 854.
 Lowenstein, F., 684.
 Lowman, M. S., 59.
 Loy, H. W., Jr., 442.
 Lozinski, E., 715.
 Lubberts, D., 205.
 Lubitz, J. A., 376, 640, 644, 787.
 Lubitz, R. S., 724.
 Lucas, E., 218.
 Lucas, P. S., 520, 527.
 Luck, J. M., 663, 801.
 Luckner, J. T., 403.
 Ludbrook, W. V., 373.
 Ludden, J. B., 135.
 Ludwig, L. M., 519.
 Ludwig, C. A., 316, 317.
 Ludwig, D., 89.
 Luebke, B. H., 685.
 Lumsden, D., 61.
 Lunde, G., 704.
 Lundquist, N. S., 520.
 Lush, J. L., 176, 177, 238, 327.
 Lush, R. H., 93.
 Lute, A. M., 718.
 Luthra, J. C., 363, 364.
 Lutman, B. F., 362, 775.
 Luttrell, E. S., 78.
 Lutz, H., 59.
 Lutz, J. F., 41, 306.
 Lutz, J. M., 50, 54, 621.
 Luxford, R. F., 639.
 Lyle, C., 143, 430, 502.
 Lyle, E. W., 371.
 Lyman, R. A., 181.
 Lynch, D. W., 63.
 Lynch, S. J., 368, 370, 619.
 Lyon, B. M., 533.
 Lyon, C. J., 201.
 Lyons, W. E., 181, 607.
 McAlister, E. D., 807.
 McAlister, E. D., 169.
 McAlister, J., 32.
 McAtee, W. L., 639.
 McBeth, C. W., 364, 365.
 Mabon, H. E., 572.
 McBryde, C. N., 536, 664.
 McCall, G. L., 217.
 McCalla, T. M., 32, 163, 326, 601.
 McCallan, S. E. A., 456.
 McCallum, E., 189.
 McCallum, R. D., 367.
 McCampbell, C. W., 92, 94.
 McCarter, J., 399.
 McCarter, J. R., 252.
 McCarty, M. A., 95, 803.

- McCay, C. M., 374, 382, 948, 850.
 McClary, C. F., 466, 518.
 McCleskey, C. S., 846.
 McClintock, J. A., 191, 352.
 McClung, L. S., 174, 406.
 McClure, F., 395.
 McClure, F. J., 129.
 McClure, G. M., 304.
 McClure, J. T., 445.
 McCollum, E. V., 2, 561, 712.
 McComb, A. L., 201.
 McConnell, H. S., 506.
 McConnell, K. P., 334.
 McCool, M. M., 736.
 McCormack, A. A., 300.
 McCown, J. D., 42.
 McCoy, E., 32, 174.
 McCoy, E. E., 376.
 McCoy, E. E., Jr., 83.
 McCoy, O. R., 105.
 MacCreary, D., 84, 509.
 McCulloch, E. C., 105, 525, 528.
 McCulloch, L., 638.
 McCullough, H. A., 740.
 McCune, S., 13.
 McDaniel, E. L., 222, 643.
 MacDaniels, L. H., 840.
 McDermott, J. J., 627.
 MacDonald, G. B., 160, 201, 205.
 McDonald, H. G., 116, 516, 528.
 McDonald, R., 565.
 McDonald, V. R., 525.
 McDonough, K. B., 417.
 MacDougal, D. T., 314.
 McDougle, H. C., 864.
 MacDowell, E. C., 747.
 McElroy, L. W., 94, 232, 384, 802.
 McElwee, E. W., 477.
 McElwen, A. D., 665, 667.
 McFadden, E. S., 204.
 McFarlane, J. S., 472.
 McFarlane, W. T., 159.
 McGeorge, W. T., 168, 232, 591.
 McGibbon, W. H., 720.
 McGillivray, J. H., 349.
 McGoldrick, F., 740.
 McGovran, E. R., 220.
 McGowan, E. B., 141.
 McGregor, E. A., 92, 381.
 Machacek, J. E., 360.
 Machado, A., 399.
 McHenry, E. W., 413.
 McIlhenny, E. A., 36.
 MacIntire, W. H., 22, 445, 593.
 McIntosh, J. A., 571, 720.
 Mack, M. J., 103, 809.
 Mack, W. B., 348, 489, 742.
 McKaig, N., Jr., 14, 42, 165, 383, 450.
 McKay, J. W., 198.
 McKee, R. W., 297, 427, 533.
 McKellip, I., 393.
 McKenney, F. D., 110.
 Mackenzie, C. G., 712.
 McKenzie, F. F., 327, 331, 381, 576.
 Mackenzie, G. M., 390.
 Mackenzie, J. B., 712.
 McKenzie, M. A., 769.
 McKeown, T., 335.
 McKibben, E. G., 257.
 McKibbin, J. M., 387.
 Mackintosh, D. L., 92.
 Mackney, A. W., 460.
 McLane, S. R., 378.
 McLaughlin, F. A., 189.
 McLaughlin, W. W., 587.
 McLean, D. D., 89.
 McLean, D. M., 209.
 McLean, F. C., 604.
 McLean, H. C., 52, 53.
 McLean, J. G., 362, 773.
 McLees, E., 19, 448.
 MacLennan, R. F., 784.
 MacLeod, F. L., 555.
 MacLeod, G. F., 502.
 Macleod, J., 379.
 MacLeod, J. H., 785.
 MacLinn, W. A., 300.
 McMartin, A., 495.
 McMeekan, C. P., 387.
 McMillin, H. R., 726.
 McMullen, D. B., 83.
 McMunn, R. L., 635.
 McMurtrey, J. E., Jr., 356.
 McNally, A. G., 785.
 McNally, E. H., 388.
 McNamara, H. C., 41.
 McNamara, W. L., 710.
 McNaught, J. B., 320.
 McNeil, E., 406, 664.
 McNew, G. L., 480.
 McNutt, C. W., 328, 603, 747.
 McNutt, P. V., 1, 2, 722.
 McNutt, S. H., 231, 532, 664.
 McPeck, R., 400.
 McPhail, M., 648.
 MacPherson, A. I. S., 139.
 MacPherson, H. G., 12.
 MacPhillamy, H. B., 139, 714.
 Macrae, T. F., 856.
 McRoberts, V. F., 382.
 McShan, W. H., 328.
 McVeigh, L., 169, 172.
 McVey, W. C., 726.
 MacVicar, E., 595, 598.
 McWhorter, F. P., 215, 216.
 Macy, H., 393, 394.
 Macy, I. G., 562.
 Madan, M. L., 738.
 Madden, F., 285.
 Madden, S. C., 439.
 Madsen, H., 82.
 Madsen, L. L., 233, 517.
 Madsen, M. A., 95, 716.
 Magstad, O. C., 737.
 Magner, J. M., 501.
 Magness, H. N., 733.
 Magnus, J. F., 472.
 Maguire, B., 618.
 Magyar, I., 423.
 Mahoney, C. H., 347, 348.
 Mail, G. A., 374.
 Main, R. J., 715.
 Maines, W. W., 227.
 Mains, E. B., 68.
 Mairs, T. I., 238.
 Maisurow, D. K., 486.
 Maisels, M., 711.
 Major, R. T., 440.
 Malan, A. I., 234.
 Malbieve, E. I., 73.
 Maldonado, J. F., 82, 821.
 Mallari, A. I., 95.
 Mallery, T. D., 159.
 Mallett, E. T., 394.
 Mallison, E. D., 54.
 Mallman, W. L., 105, 125.
 Maneval, W. E., 326.
 Maney, T. J., 190, 621.
 Mangelsdorf, P. C., 462.
 Mangus, A. R., 719.
 Manis, H. C., 786.
 Manly, M. L., 697.
 Manly, R. S., 697.
 Mann, G. E., 518.
 Mann, L. K., 28.
 Manning, W. E., 31, 170.
 Manns, T. F., 65.
 Manson, P. W., 675, 676.
 Manthei, C. A., 531.
 Manwell, R. D., 114, 529, 826.
 Marais, J. S. C., 232, 233.
 Marcello, L. S., 594.
 Marchionatto, J. B., 634.
 Marcovitch, S., 226, 502.
 Marcy, L. F., 234.
 Margabandhu, V., 645.
 Mark, J., 333.
 Markee, J. E., 603.
 Markley, K. S., 157, 293, 294.
 Markley, M. C., 532.
 Markus, H. Y., 665.
 Markwood, L. N., 298, 299.
 Marlow, H. W., 333, 750.
 Marquardt, J. C., 245, 246, 527, 663, 726.
 Marr, J. C., 159, 828.
 Marsh, H., 107, 535.
 Marsh, R. P., 167.
 Marshall, C. E., 309, 446.
 Marshall, D., 287.
 Marshall, E. D., 718.
 Marshall, G. E., 643, 778.
 Marshall, J. F., 377.
 Marshall, R. E., 685.
 Marston, A. R., 185.
 Marth, P. C., 55.
 Martin, D. W., 423.
 Martin, E. M., 372.
 Martin, E. V., 316.
 Martin, H., 206.
 Martin, J. F., 373.
 Martin, J. H., 431.
 Martin, J. N., 182, 185, 205.

- Martin, J. P., 488
 Martin, J. T., 641, 642.
 Martin, W. E., 198.
 Martin, Willard H., 98, 394, 663.
 Martin, William H., 362, 775.
 Martin, W. J., 771.
 Marton, L., 326.
 Maruyama, C. L., 238.
 Marx, L., 468.
 Marx, W., 335.
 Mason, E. A., 315.
 Mason, H. C., 279
 Mason, H. G., 542.
 Mason, H. L., 566
 Mason, I. C., 620.
 Mason, T. G., 27, 453, 454, 455, 597.
 Massee, A. M., 376.
 Massey, L. M., 371.
 Massey, Z. A., 652, 802.
 Mast, S. O., 784.
 Mathews, O. R., 183.
 Mathur, C. B., 644.
 Matson, H., 544.
 Matsumoto, K., 352.
 Matsuura, M., 204, 628
 Matthewman, W. G., 786.
 Matthews, C. A., 39.
 Matthews, C. S., 606
 Matthews, D. N., 203.
 Matthews, E. D., 341.
 Matthews, E. M., 616.
 Matthews, J. E., Jr., 853.
 Matthews, T. M., 627.
 Mattill, H. A., 153, 334
 Mattison, J. R., 42, 65.
 Mattoon, W. R., 690.
 Mattson, H., 52.
 Matzen, E. H., 837.
 Maw, A. J. G., 231, 247.
 Maxted, W. R., 399.
 Maxwell, C. W. B., 785, 786.
 Maxwell, M. L., 847.
 Maxwell, L. R., 746.
 May, C., 81.
 May, E. L., 440.
 May, E., 328.
 Mayer, D. T., 327.
 Mayer, L. S., 479.
 Mayfield, H. L., 705.
 Mayhugh, M. S., 367.
 Maynard, L. A., 100, 382, 418, 564, 576, 663, 801, 848.
 Mayton, E. L., 470.
 Mazanko, F. P., 456.
 Masurak, A., 586.
 Mead, S. W., 240, 520.
 Meamber, D. L., 297.
 Means, E. H., 338, 516.
 Mecchi, E., 255.
 Meense, A. D. J., 460.
 Megee, C. R., 65.
 Mehlquist, G. A. L., 34, 498.
 Mehrhof, N. R., 604, 651.
 Mehta, K. C., 71, 632.
 Meitzer, O. E., 302, 542.
 Meites, J., 519, 607.
 Melchers, L. E., 47, 65, 363.
 Meldrum, H. R., 160, 182, 184.
 Melhus, I. E., 182, 205, 772.
 Mellanby, E., 697.
 Mello, E. M. M., 665
 Melnick, D., 584.
 Melvin, R., 502.
 Mencarini, G., 497.
 Mendall, S. C., 794
 Mendell, F. H., 160
 Mendes, A. J. T., 462.
 Menefee, E. R., 865.
 Mentzer, R. L., 509
 Menzies, A. W. C., 460.
 Menzies, J. D., 487.
 Merchant, I. A., 105.
 Merdian, B. C., 679
 Meredith, C. H., 490, 772
 Merkle, F. G., 163.
 Merrick, D. E., 679.
 Merrick, F., 829.
 Merrill, M. H., 647
 Merrill, R. M., 261.
 Merritt, P. P., 582.
 Mesrobian, L., 530.
 Metcalf, R. L., 507.
 Metcalfe, E., 709
 Metcalfe, G., 363.
 Metzger, C. H., 122.
 Metzger, H. J., 532.
 Metzger, J. E., 600.
 Metzger, W. H., 13, 117, 304,
 Meulen, E. V., 618.
 Meull, L. J., 488.
 Meurman, O., 482.
 Meyer, C. E., 560, 852.
 Meyer, F. L., 861
 Meyer, J., 126.
 Meyer, M. A., 331.
 Meyer, R. K., 328.
 Meyer, S. L., 169.
 Michael, P., 126.
 Michelbacher, A. E., 644.
 Michels, C. A., 750.
 Michener, H. D., 181.
 Mickel, C. E., 648.
 Mickelson, M. N., 7, 174, 296.
 Middleton, G. K., 69.
 Midgley, A. R., 594.
 Mielke, J. L., 373.
 Mighell, R. L., 683, 684.
 Milam, F. M., 732.
 Milbrath, J. A., 201, 216.
 Milby, T. T., 389, 808.
 Miles, C., 767.
 Miles, E. T., 729.
 Miles, I. E., 735.
 Miles, L. E., 288, 430, 470, 493, 768.
 Millar, C. E., 167.
 Miller, C. D., 268.
 Miller, D. G., 675.
 Miller, E. C., 40, 65.
 Miller, E. I., 689.
 Miller, E. J., 152, 208, 241.
 Miller, E. S., 462.
 Miller, E. V., 154
 Miller, F. E., Jr., 501
 Miller, G. L., 776.
 Miller, H. A., 169.
 Miller, H. D. O., 499
 Miller, H. J., 366.
 Miller, J. C., 740.
 Miller, J. T., 303.
 Miller, K., 392.
 Miller, L. L., 561.
 Miller, L. P., 169, 509.
 Miller, M. E., 527.
 Miller, P. A., 372.
 Miller, P. G., 98, 105
 Miller, P. R., 768.
 Miller, P. W., 370
 Miller, R. C., 95, 386, 803
 Miller, R. E., 97
 Miller, T. A. H., 547.
 Miller, V. L., 518.
 Milligan, J. G., 821.
 Millikan, C. R., 208.
 Mills, C. A., 586.
 Mills, E. J., Jr., 608.
 Mills, F. C., 864.
 Mills, J. W., 107.
 Mills, R. C., 422.
 Mills, W. D., 76, 214, 365.
 Milne, R. A., 590.
 Milner, H. W., 171.
 Milner, E. T., 158.
 Milton, H. M. II, 865.
 Mindlin, R. L., 135.
 Minert, K. R., 520.
 Mingos, P. A., 182.
 Mingle, C. K., 531.
 Minibeck, H., 420.
 Minor, F. W., 317.
 Minot, A. S., 136.
 Mirkowich, N., 688.
 Mirov, N. T., 598.
 Mitchell, C. A., 817.
 Mitchell, H. H., 127, 238.
 Mitchell, H. K., 322.
 Mitchell, H. S., 1, 272, 273, 845.
 Mitchell, J. H., 8, 14, 42, 48, 92, 98, 105.
 Mitchell, J. W., 26.
 Mix, A. J., 372.
 Mixner, J. P., 333, 335
 Mixer, R., 605.
 Miyata, I., 528.
 Moe, L. H., 532, 815.
 Mohammed Fouad el Gammal, 88.
 Mohler, J. R., 537, 664.
 Molander, E. G., 547.
 Molln, A. E., 327.
 Monachino, J., 23.
 Monk, J. W., 648.
 Monke, J. V., 271.
 Monlux, W. S., 527.
 Monosmith, R. O., 624.
 Monroe, H. A. U., 785, 788.
 Monroe, C. F., 519.
 Monroe, D., 270, 284, 862.

- Monroe, M. M., 717.
 Monson, O. W., 159, 732.
 Montandon, R., 12.
 Montgomery, G., 117.
 Montgomery, J. T., 327.
 Montgomery, R. B., 11.
 Montgomery, T. M., Jr., 264.
 Mooers, C. A., 575.
 Mook, P. V., 81.
 Moomaw, L., 42.
 Moon, E. L., 499.
 Moon, H. H., 50.
 Moon, J. W., 307, 730.
 Moore, B., 275.
 Moore, B. H., 327.
 Moore, C. R., 331.
 Moore, E. J., 206, 210.
 Moore, E. L., 273, 740.
 Moore, E. N., 660.
 Moore, G. R., 820.
 Moore, J. B., 221, 230.
 Moore, J. G., 478, 496.
 Moore, J. H., 282, 474.
 Moore, J. S., 522.
 Moore, L. A., 241, 520, 583, 865.
 Moore, M., 818.
 Moore, M. H., 206, 366.
 Moore, O. K., 603.
 Moore, R. E., 304, 732.
 Moore, T., 573, 817.
 Moore, W. C., 66.
 Moore, W. T., 713.
 Moraes Mello, E. M., 665.
 Morgal, P. W., 152.
 Morgan, A. F., 276, 421, 573, 844, 855.
 Morgan, B., 262.
 Morgan, B. B., 82, 405.
 Morgan, C. L., 92, 236.
 Morgan, D. O., 669.
 Morgan, E. L., 552, 838.
 Morgan, I. M., 254, 824.
 Morgan, J. F., 152.
 Morgan, M. E., 520.
 Morgan, M. F., 447.
 Morgan, R. B., 235.
 Morgareidge, K., 700.
 Morgulis, S., 278.
 Morin, C., 595.
 Moriya, A., 327.
 Morley, P. M., 785.
 Morozov, A. S., 320.
 Morrill, A. W., Jr., 512, 786.
 Morrill, C. C., 109, 540.
 Morris, A. J., 238.
 Morris, L. S., 717.
 Morris, M. L., 538.
 Morris, O. M., 52, 477, 481.
 Morris, V. H., 840.
 Morrison, B. V., 285.
 Morrison, F. B., 382.
 Morrison, F. L., 801.
 Morrison, H. B., 102, 519.
 Morrison, H. B., Jr., 394.
 Mortensen, M., 239.
 Mortimer, M. F., 794.
 Morton, R. A., 7, 8.
 Morwick, F. F., 592.
 Moser, A. M., 125.
 Moser, F., 42, 313, 571.
 Moses, B. D., 394.
 Moses, H. E., 664.
 Moskey, H. E., 106.
 Moss, C., 520.
 Moss, W. A., 751.
 Mote, D. C., 86, 502.
 Mott, L. O., 670.
 Mottorn, H. H., 10, 300.
 Mottram, V. H., 559.
 Moulton, F. R., 453, 461, 490.
 Mourmoseff, G., 600.
 Mowry, H., 608.
 Moxon, A. L., 113, 390, 825.
 Moynihan, I. W., 404.
 Mudd, S., 32, 174, 326.
 Mudge, C. S., 394, 395.
 Muelder, K. D., 700.
 Mueller, C. D., 329.
 Mueller, J. F., 405.
 Mueller, M. M., 294.
 Mueller, W. S., 659, 809.
 Muenschner, W. C., 23.
 Muir, R. M., 27.
 Muirhead, D. M., 792.
 Mukharevskaya, M. I., 324.
 Mulder, H., 244, 245, 444.
 Mulford, F. L., 61, 624.
 Mullen, F. A., 414.
 Muller, C. H., 171.
 Mullins, T., 678.
 Mullison, W. R., 25.
 Mulvey, B. R., 758.
 Muncie, J. H., 65, 492, 776.
 Munger, H. M., 720.
 Munger, M., 531.
 Munger, T. T., 202, 203.
 Munks, B., 696.
 Munn, M. T., 761.
 Munro, H. K., 85.
 Munro, J. A., 72, 219, 506.
 Munro, S. S., 654.
 Munsell, R. I., 311.
 Murata, H., 313.
 Murie, A., 500.
 Murie, O. J., 500.
 Murneek, A. E., 29, 201, 764.
 Murphy, D. M., 71, 769.
 Murphy, F. T., 181, 190.
 Murphy, H. C., 182, 205.
 Murphy, H. F., 21.
 Murphy, M. M., Jr., 765.
 Murray, C., 247.
 Murrill, W. A., 170, 315.
 Musgrave, A. J., 641.
 Musgrave, G. W., 732.
 Musil, A. F., 340.
 Muskavitch, L. E., 446.
 Muskett, A. E., 73, 493.
 Musseiman, H. H., 676.
 Muth, O. H., 823.
 Mutul, I. F., 453.
 Myburgh, S. J., 801.
 Myers, A. T., 154.
 Myers, H. E., 13, 163, 336, 753.
 Myers, H. G., 431.
 Myers, R. M., 27.
 Myers, R. P., 661.
 Myers, W. I., 680.
 Nabours, R. K., 747.
 Naftziger, L. M., 445.
 Naftel, J. A., 445.
 Naghski, J., 33.
 Nagy, R., 600.
 Najjar, V. A., 702.
 Nakajima, G., 528.
 Nakamura, J., 528, 529.
 Nakata, K., 213, 214.
 Naibandov, A., 327.
 Namikawa, S., 520.
 Nanda, D. N., 644.
 Naphtali, D. K., 786.
 Nash, K. B., 513.
 Nast, C. G., 169.
 Navalikhina, N. K., 462.
 Navarro de Andrade, E., 767.
 Naylor, A. W., 323.
 Naylor, N. M., 151.
 Neal, D. C., 768.
 Neal, E. M., 385.
 Neal, N. P., 522.
 Neal, O. B., 160, 732.
 Neal, P. A., 642.
 Neal, W. M., 241, 651, 665.
 Neary, M. E., 786.
 Necker, W. L., 500.
 Needham, J. G., 86.
 Needham, M., 245.
 Neel, L. R., 470, 516, 521.
 Neely, J. W., 470.
 Neergaard, P., 206.
 Neff, J. A., 499.
 Nelburger, M., 585.
 Neis, B., 728.
 Neish, A. C., 361.
 Neiswander, C. R., 793.
 Neiswander, R. B., 643.
 Neller, J. R., 590, 596, 608, 619, 765.
 Nelsen, O. E., 604.
 Nelson, A. G., 550.
 Nelson, C. J., 768.
 Nelson, C. E., 312, 471.
 Nelson, C. I., 268.
 Nelson, D., 606.
 Nelson, D. H., 101, 865.
 Nelson, E. C., 405.
 Nelson, F. M., 98.
 Nelson, J. W., 391.
 Nelson, L., 717.
 Nelson, L. B., 472.
 Nelson, M., 472.
 Nelson, M. E., 293.
 Nelson, M. M., 426.
 Nelson, P., 677, 830.
 Nelson, P. M., 231, 268, 854.
 Nelson, R., 65.
 Nelson, R. C., 465.

- Nelson, R. H., 501.
 Nelson, V. E., 854.
 Nelson, W. O., 335.
 Nestler, R. B., 784.
 Nettles, V. F., 470, 610.
 Netz, C. V., 174.
 Neu, R. G., 446.
 Neubert, A. M., 10, 800, 444, 556.
 Neustadt, M. H., 6.
 Neuweiler, W., 133.
 Neuweit, F., 126.
 Newcomer, E. H., 718.
 Newcomer, E. J., 502.
 Newell, I. M., 503.
 Newell, L. C., 184.
 Newell, W., 717.
 Newman, A. S., 733.
 Newman, F. S. J., 661.
 Newman, K. R., 134, 724.
 Newmark, J. H., 811.
 Newsom, I. E., 287.
 Newton, M., 326, 359.
 Newton, R., 26.
 Nicholas, J. E., 262.
 Nicholls, J., 415.
 Nicholls, W. D., 121.
 Nicholls, W. H., 262.
 Nichols, R. E., 431.
 Nichols, R. L., 588.
 Nicholson, L. G., 528.
 Nickle, H. G., 471, 477.
 Nicol, J. M., 643.
 Niel, C. B. van, 173, 453.
 Nield, C. H., 443.
 Nielsen, E. L., 612.
 Nielsen, N., 317.
 Nielsen, S., 102.
 Nikiforoff, C. C., 307.
 Nikolaeva (Nikoloyeva), R. G., 73, 74.
 Nikoloyeva, R. G., 73, 74.
 Nisi, T., 528.
 Niven, C. F., Jr., 33, 398.
 Nixon, G. E. J., 799.
 Noble, C. V., 677.
 Noble, M., 363.
 Noble, P. V., 747.
 Nobuto, K., 529.
 Noggle, G. R., 169.
 Noguera, J. R., 849.
 Nohmi, S., 528.
 Nolan, A. F., 109.
 Nolan, A. W., 121.
 Nolan, L. S., 270.
 Noll, C. I., 520.
 Nord, F. F., 68, 173.
 Nord, W. H., 405.
 Nordlund, I., 672.
 Norman, A. G., 33, 151, 160, 309, 438, 600, 613, 733.
 Norris, D. O., 493.
 Norris, F. A., 294, 295.
 Norris, L. C., 255, 298.
 North, M. O., 655.
 Northrup, I. W., 271.
 Norton, L. R., 221, 793.
 Norton, L. J., 696.
 Novikov, B. G., 179.
 Noyes, B., 451.
 Nuckols, R. B., 342.
 Nussbaum, C. J., 48, 65, 768.
 Nussbaum, M., 32.
 Nutman, F. J., 596.
 Nutt, G. B., 115.
 Nutting, H., 122.
 Nybrotten, N., 829.
 Nygard, I. J., 733.
 Obregon Botero, R., 208.
 O'Brien, G. E., 739.
 O'Brien, J. A., Jr., 169.
 Ocfemia, G. O., 789.
 Ochi, Y., 528.
 Ochoa, S., 132.
 O'Dell, B. L., 96.
 Oderkirk, A. D., 262.
 Odland, T. F., 449.
 Odum, E. P., 640.
 Oertel, E., 91.
 Oexemann, S. W., 453.
 Ogasahara, K., 790.
 Ogden, M., 679.
 Ogden, W. B., 472.
 Okubo (Okubo), Y., 529, 529.
 Ohlson, M. A., 268.
 Ohske, P., 570.
 O'Kane, D. J., 461.
 O'Kane, W. C., 787.
 O'Kelly, J. F., 470.
 Okrent, A., 442, 861.
 Okubo, Y., 528, 529.
 Olbrycht, T. M., 747.
 Oliger, I. M., 542.
 Oliver, W. B., 738.
 Olliver, M., 570.
 Olmstead, L. B., 306, 732.
 Olmsted, W. H., 152.
 Olney, J. F., 539, 664.
 Olsen, C., Jr., 815.
 Olsen, M. W., 253, 390.
 Olsen, O. W., 640.
 Olsen, T. I., 576.
 Olson, L. C., 51, 209, 480, 756.
 Olson, T. M., 394, 655.
 Olsson, A., 541.
 Olsson, P. A., 496.
 O'Mara, J. G., 326.
 O'Neil, J. B., 654, 807.
 O'Neill, W. J., 375, 477, 503.
 Oordt, G. J. van, 468.
 Oostuizen, M. J., 85.
 O'Rear, H. M., 664.
 Orent-Kelles, H., 698.
 Orian, G., 776.
 Orlov, A. P., 179.
 Orr, R. T., 374.
 Osborn, C. M., 604.
 Oserkowsky, J., 350.
 Osgood, H. S., 848.
 Osmond, H. L., 303.
 Osmun, A. V., 769.
 Osteen, O. L., 111, 870.
 Osterberg, A. E., 424.
 Ostergaard, P. S., 101.
 Ostroienk, M., 156.
 Otis, L., 854.
 Ott, G. L., 384, 404.
 Otto, M. L., 117.
 Outhouse, E. L., 819.
 Overchkin, S., 343.
 Overbeek, J. van, 169, 319.
 Overcast, W. W., 521.
 Overholser, E. L., 477, 481, 487.
 Overholts, L. O., 171.
 Overley, F. L., 471, 477, 481, 487.
 Overpeck, J. C., 694.
 Overstreet, M. R., 691.
 Owen, C. A., 574.
 Owen, C. R., 289, 336.
 Owen, F. V., 73.
 Owen, J. C., 303.
 Owen, W. M., 50.
 Owens, C. E., 214.
 Owens, L. B., 566.
 Owens, N. A., 137.
 Oxford, A. E., 326.
 Pacheco, G., 512.
 Pacheco, S. D., 848, 849.
 Packard, C. M., 789.
 Paddock, F. R., 218, 640.
 Paden, W. R., 42.
 Pady, S. M., 373.
 Page, J. B., 161, 447.
 Page, L. F., 11, 12.
 Page, N. R., 740.
 Paget, F. H., 587.
 Paine, J. R., 666.
 Painter, B. T., 603.
 Painter, E. P., 399.
 Painter, J. H., 199.
 Painter, R. H., 84, 789.
 Pal, B. P., 71.
 Paley, C., 658.
 Palliova, J. K., 433.
 Palkin, S., 11.
 Pallesen, J. E., 180.
 Palmer, C. C., 107.
 Palmer, D. B., 254.
 Palmer, L. S., 228, 391, 519, 659.
 Palmer, W. C., 286.
 Pandittesekere, D. G., 570.
 Panfilova, E. P., 328.
 Panshin, A. J., 203.
 Papadakis, J. S., 23, 163.
 Pappenheimer, A. M., 255.
 Parcher, L. A., 677.
 Parish, H. E., 502.
 Park, E. A., 712.
 Park, O. W., 218, 640.
 Park, W. J., 242.
 Parker, E. R., 357, 623.
 Parker, J. M., 337.
 Parker, K. G., 683.
 Parker, L. A., 783.
 Parker, M. E., 320, 658, 661.
 Parker, M. M., 346.

- Parker, M. W., 28.
 Parker, R. L., 84, 380, 640.
 Parker-Rhodes, A. F., 19.
 Parkhurst, R. T., 804.
 Parks, K. H., 828.
 Parks, R. Q., 719.
 Parman, D. C., 501.
 Parmelee, F. T., 792.
 Parnall, C., Jr., 860.
 Parran, T., 2.
 Parris, G. K., 72, 204, 490, 491, 628.
 Parrott, E. M., 806.
 Parrott, I. M., 474.
 Parshall, R. L., 587.
 Parsons, C. H., 244, 394, 800.
 Parsons, F. L., 98, 117.
 Parsons, H., 478.
 Parsons, H. T., 275.
 Parsons, K. H., 680.
 Parsons, O. A., 830.
 Parsons, W. J., Jr., 159.
 Partridge, N. L., 591.
 Parvin, D. W., 410, 550.
 Paschkis, K. E., 331, 332, 749.
 Patel, M. K., 637.
 Paterson, J. S., 248.
 Patrick, C. S., 42.
 Patrick, H., 96, 674.
 Patrick, S., 208.
 Patrushev, V. I., 404.
 Patterson, N. A., 786.
 Patton, A. R., 168.
 Paulson, W. E., 119.
 Payne, F., 603.
 Payne, L. F., 92.
 Peacock, G., 727.
 Peacock, N. D., 445.
 Peairs, L. M., 501.
 Pearce, G. W., 503.
 Pearse, E. H., 386.
 Pearson, G. A., 625.
 Pearson, F. B., 235, 382, 857.
 Pearson, R. W., 160, 449.
 Pecher, C., 416.
 Pecher, J., 416.
 Pederson, C. S., 154, 174, 814, 843.
 Redlow, J. T., 642.
 Peech, M., 310, 590, 737.
 Peele, T. C., 14, 164.
 Peet, L. J., 285.
 Peavy, W. J., 438.
 Pelczar, M. J., Jr., 441.
 Pellett, F. C., 640.
 Pence, J. A., 661.
 Penczek, E. S., 293.
 Penman, H. L., 15.
 Pennell, R. B., 530.
 Penner, C. M., 12.
 Pennington, D., 442, 807.
 Penquite, R., 889.
 Pepper, B. B., 480, 508, 796.
 Pepper, J. H., 507, 646.
 Peppler, H. J., 662.
 Percival, G. P., 46.
 Perkins, A. E., 519.
 Perkins, A. T., 13, 738.
 Perkins, F., 2.
 Perkins, S. O., 590.
 Perkins, W. R., 611.
 Perlova, B. L., 463.
 Perlzweig, W. A., 860.
 Permar, D., 605.
 Perrin, D. H., 629.
 Perrine, D. B., 788.
 Perry, E. A., 733.
 Perry, M., 862.
 Perry, N. A., 660.
 Perry, W. W., 697.
 Persike, E. D., Jr., 39.
 Persing, C. O., 376, 784.
 Petering, H. G., 152.
 Peters, B. G., 248.
 Peters, C. A., 739.
 Peters, C. W., 553, 685.
 Peters, D., 720.
 Peters, D. L., 144.
 Petersen, W. E., 232, 242, 334, 392, 519.
 Peterson, H. B., 163, 734.
 Peterson, J. B., 160, 446.
 Peterson, M. J., 118, 678.
 Peterson, W. E., 39.
 Peterson, W. H., 241, 326, 519, 651.
 Peterson, W. J., 94, 382, 583, 808.
 Petheram, H. D., 486.
 Petri, L., 488.
 Petrov, S. G., 605.
 Pette, J. W., 242, 243.
 Petty, M. A., 68.
 Pfaff, H. L., 186.
 Pfeiffer, C. A., 332, 603.
 Pfeiffer, H., 315.
 Pfund, M. C., 122.
 Phelps, A. S., 32.
 Phillips, F. S., 329.
 Phillips, A. M., 218, 219, 374.
 Phillips, C. E., 40.
 Phillips, E. F., 228.
 Phillips, F. S., 603.
 Phillips, J. E., 63.
 Phillips, L., 386.
 Phillips, P. H., 178, 422, 468, 520, 749.
 Phillips, R. E., 176.
 Phillips, R. W., 35, 95, 382, 576, 710, 717.
 Phillips, T. G., 153.
 Phillips, W. H., 47.
 Phillips, E., 27, 453, 454, 455, 597.
 Phipard, E. F., 270.
 Place Mohan Verma, 644.
 Pickard, J. N., 604.
 Pickett, A. D., 786.
 Pickett, B. S., 48, 190.
 Pickett, T. A., 725, 728, 740, 757, 765, 855.
 Pickett, W. F., 47.
 Pictet, A., 464.
 Pierce, C. W., 523.
 Pierce, H. B., 556.
 Pierce, W. D., 227.
 Pieres, R. B., 353.
 Pierpont, R. L., 84, 504, 510.
 Pierre, W. H., 100, 182, 185.
 Pierson, A. H., 64.
 Pies, R., 855.
 Piesse, C. L., 370.
 Pihlblad, C. T., 841.
 Pike, R. M., 399.
 Pиковski, M., 404.
 Pillar, R., 655.
 Pillemer, L., 709.
 Pillow, M. Y., 485.
 Wilson, J. E., 228.
 Pinckard, J. A., 865.
 Pincus, G., 334.
 Pine, W. H., 117.
 Piper, C. S., 66.
 Piper, R. B., 637.
 Pirie, N. W., 68.
 Pirone, P. P., 215, 371, 372, 624, 638, 720.
 Pitner, J., 336, 341, 470.
 Pittier, H., 452.
 Pittman, D. W., 592.
 Pittman, M. S., 126.
 Plage, H. H., 190.
 Plage, J. C., 608.
 Plakidas, A. G., 77, 761, 769.
 Plank, J. E., van der, 478, 479.
 Plastringer, W. N., 534.
 Platenius, H., 620.
 Platt, C. S., 466, 518, 653.
 Plessis, C. du, 85, 368.
 Plitt, T. M., 595, 639.
 Plum, N., 536.
 Plummer, B. E., Jr., 593, 629.
 Plummer, C. C., 648.
 Poe, C. F., 411, 420, 427.
 Pohle, E. M., 382.
 Pohle, W. D., 156, 283, 295.
 Polevitsky, K., 32, 174.
 Polevoi, V. V., 405.
 Poley, W. E., 97, 113, 390.
 Poliakova, T. F., 459.
 Poling, C. E., 134.
 Polivka, J. B., 719.
 Polk, H. D., 383, 547.
 Polk, H. T., 115.
 Pollack, H., 702.
 Pollard, L. H., 192.
 Pollard, N., 599.
 Pollinger, W. E., 757.
 Pomeroy, B. S., 39, 827.
 Pomeroy, R. W., 387.
 Ponce, A., 91.
 Poncher, H. G., 562, 715.
 Ponder, H. A., 470.
 Pont, E. G., 396, 812.
 Ponting, J. D., 299.
 Poole, W. D., 186.
 Popova, A. A., 73, 74.
 Poppensiek, G. F., 393.
 Porte, W. S., 74.
 Porter, R. A., 376.
 Porter, C. L., 632.

Porter, C. R., 40
 Porter, D. R., 191, 349.
 Porter, J. R., 461.
 Porter, R. H., 182, 185, 205
 Porter, T., 567, 606.
 Porterfield, H. G., 456.
 Porthelm, L., 599.
 Poschenrieder, H., 317.
 Posnette, A. F., 368.
 Post, A. H., 473.
 Post, K., 60, 61, 451.
 Potgieter, M., 123, 268.
 Potter, C., 641.
 Potter, G. F., 190.
 Potter, J. S., 747.
 Potts, S. F., 501.
 Poulson, E. N., 590.
 Poulter, R. W., 169.
 Powell, D., 75, 635.
 Powell, E. B., 510.
 Powell, E. L., 551.
 Powell, R. C., Jr., 519.
 Powers, A. J., 524.
 Powers, W. L., 164, 455, 730.
 Powick, W. C., 674.
 Pratt, B. G., 795.
 Pratt, E. F., 319.
 Pratt, I., 826.
 Preston, C., 455.
 Price, D., 440, 605.
 Price, F. E., 245, 804, 808.
 Price, G. T., 529.
 Price, P. M., 258.
 Price, W. C., 770.
 Price, W. V., 246, 396.
 Prillinger, F., 606.
 Prince, F. S., 46, 591.
 Pritsker, I. Y., 97.
 Proctor, P., Jr., 374.
 Propp, G. J., 381.
 Frouxy, C. C., 521, 661.
 Provan, A. L., 104.
 Pruthi, H. S., 89.
 Pryor, D. E., 493.
 Pucher, G. W., 292.
 Pugsley, A. T., 206.
 Pulley, G. N., 154.
 Puri, A. N., 731.
 Puri, B. R., 731.
 Purvis, E. R., 312.
 Putman, W. L., 377, 785.
 Putt, E. D., 31.
 Pyenson, L., 785.
 Pyke, M., 701.
 Pyke, W. E., 556, 558, 840.
 Qualfe, E. L., 176.
 Quayle, W. L., 143, 340.
 Quick, A. J., 428, 584.
 Quigley, G. D., 748, 827.
 Quinlan, L. R., 40, 47.
 Quiring, D. P., 801.
 Quisenberry, J. H., 35.
 Quortrup, E. R., 674.
 Rabinovitch, A., 695.
 Rabstein, M., 532.

Rada, G. G., 215, 488.
 Rader, L. F., Jr., 6.
 Raeder, J. M., 69, 709.
 Rafey, M. S., Ed., 520
 Ragland, C. H., 197.
 Ragsdale, A. C., 519.
 Rahman, K. A., 83.
 Rahn, E. M., 345.
 Rahn, H., 603.
 Rahn, O., 33.
 Raines, M. A., 169.
 Rainwater, C. F., 84, 501, 502, 504.
 Raleigh, G. J., 349, 633.
 Raleigh, S. M., 620.
 Ramasarma, G. B., 9.
 Ramaswamy, M. S., 814.
 Ramsay, R. C., 282.
 Ramsbottom, J. M., 382.
 Ramsey, G. B., 210.
 Ramsey, H., 789.
 Rand, F. V., 577, 628.
 Randall, A. IV, 460.
 Randall, R., 538.
 Randle, S. B., 272, 516, 807.
 Rao, C. N. D., 814.
 Rao, M. V. L., 814.
 Rao, Y. V., 350.
 Raper, K. B., 464.
 Raskopf, B. D., 410, 684.
 Rasmussen, A. T., 232.
 Rasmussen, M. P., 260.
 Ratcliffe, F. N., 91.
 Rather, H. C., 185, 615.
 Ratsek, J. C., 176.
 Rattray, J. M., 478, 479.
 Rauch, V., 604.
 Raup, H. M., 451.
 Rawles, M. E., 603.
 Rawlins, T. E., 325.
 Rawlins, W. A., 505, 513.
 Ray, H. N., 538.
 Ray, W. W., 357.
 Raymond, F. E., 435.
 Raynor, E. N., 618.
 Read, P. R., 578, 717.
 Radio, P. A., 638.
 Rebrassier, R. E., 109.
 Records, E., 527.
 Reddy, C. S., 182, 205.
 Reece, P. C., 198.
 Reece, R. P., 176, 327, 332, 469, 518, 519.
 Reed, A. R., 115.
 Reed, C. A., 58.
 Reed, G. M., 746.
 Reed, H. S., 367.
 Reed, I. F., 544.
 Reed, M., 52.
 Reed, O. E., 523.
 Reed, W. W., 303, 589.
 Reeves, E. L., 780.
 Reeves, E. G., 462.
 Reeves, W. C., 647.
 Rehm, P., 417, 709.
 Reichart, E. L., 103, 521.
 Reid, J. J., 33.

Reid, M. E., 170, 325.
 Reil, M. G., 284.
 Reid, W. H. E., 246, 394, 520, 521, 524.
 Reid, W. J., Jr., 501.
 Reimer, F. C., 194.
 Reinbach-Welch, L., 44
 Reinecke, R. M., 334.
 Reineke, E. P., 101, 523
 Reineke, L. H., 485.
 Reinhard, H. J., 510.
 Reinhardt, W. O., 335.
 Reinhart, W. H., 642.
 Reinhart, W. L., 310.
 Reinking, O. A., 770.
 Reimiller, C. F., 432
 Reitz, L. P., 40, 65, 84.
 Rempel, J. G., 793.
 Renner, K. M., 726.
 Rentschler, H. C., 600.
 Reschke, J., 707.
 Rettger, L. F., 398.
 Retzer, J. L., 731.
 Rex, E. G., 498.
 Reynolds, E. B., 315.
 Reynolds, P. K., 692
 Reynolds, R. V., 64.
 Rhees, M. C., 520.
 Rhian, M., 516, 808, 825.
 Rhoad, A. O., 327.
 Rhoades, A. S., 629.
 Rhodes, A. F. P., 19
 Rice, T. D., 304.
 Ricewasser, J. C., 562.
 Rich, A. R., 141.
 Richards, A. V., 57, 198.
 Richards, D. E., 385
 Richards, L. A., 600, 732.
 Richards, O. W., 784.
 Richards, P., 682.
 Richardson, A. M., 471.
 Richardson, B. T., 690
 Richardson, C. H., 218, 640.
 Richardson, G. A., 393, 520, 525.
 Richardson, G. L., 33
 Richardson, H. L., 555.
 Richardson, J. E., 703.
 Richardson, J. W., 470
 Richardson, L. R., 96, 674.
 Richer, A. C., 754.
 Richert, D., 297.
 Richey, C. B., 719.
 Richmond, M. S., 234.
 Richter, C. P., 419.
 Richter, J. H., 119, 679.
 Rickher, C. J., 124.
 Riddle, J. W., 252.
 Riddle, O., 603, 605.
 Ridgeway, R. R., 138.
 Ridgway, R. R., 652.
 Riedl, W. A., 340, 362.
 Riegel, A., 336.
 Rieman, G. H., 471, 472, 483.
 Riemenschneider, R. W., 294.
 Riesenhol, H. S., 302.
 Rietsma, I., 353.

- Rietz, R. C., 625.
 Rigler, N. E., 25, 439.
 Riker, A. J., 64, 66, 80, 488.
 Riley, W. A., 647.
 Rinehart, E. F., 800.
 Ringdon, A. R., 604.
 Ringrose, R. C., 92, 236.
 Rinkel, G. L., 468.
 Riordan, C. F., 664.
 Rippen, A., 520.
 Ripperton, J. C., 181.
 Ritcher, P. O., 224.
 Ritchey, G. E., 608.
 Ritchie, D., 160.
 Ritchie, W. S., 273, 724, 845.
 Rittenberg, D., 559.
 Ritzman, E. G., 385.
 Rivaz, C. P., 592.
 Roach, W., 404.
 Roach, W. A., 357.
 Roadhouse, C. L., 394, 521, 811.
 Roark, R. C., 210, 502.
 Robbins, C. B., 840.
 Robbins, F. S. R., 128.
 Robbins, P. W., 627.
 Robbins, R. C., 556.
 Robbins, W. J., 29, 320, 740.
 Robert, J. C., 336, 842, 854, 470.
 Roberts, E., 35.
 Roberts, E. A. H., 822.
 Roberts, F. M., 376, 490.
 Roberts, H. E., 243.
 Roberts, H. L., 6.
 Roberts, O. C., 762.
 Roberts, R. H., 40, 458, 478, 842.
 Robertson, D., 401.
 Robertson, D. W., 339, 754.
 Robertson, E. I., 384, 516, 720, 808.
 Robertson, L., 834.
 Robichaux, R. P., 238, 243.
 Robinson, B., 22.
 Robinson, B. B., 46.
 Robinson, E. C., 647.
 Robinson, H. E., 93.
 Robinson, H. M., 283.
 Robinson, J. L., 45, 182, 185, 233, 257.
 Robinson, R. H., 762.
 Robinson, T. W., 453.
 Robinson, W. D., 860.
 Robison, W. L., 382, 517.
 Robotka, F., 263.
 Robschelt-Robbins, F. S., 128.
 Roche, B. H., 522.
 Rockwern, S. S., 566.
 Roddy, R. L., 602.
 Rodenhiser, H. A., 210.
 Roderick, D. B., 14, 48, 98.
 Roderick, L. M., 92.
 Rodney, R., 595.
 Roe, A. F., 32.
 Roe, E. I., 355, 356.
 Roe, J. H., 0.
 Roehm, R. R., 807.
 Roesser, J., Jr., 767.
 Rogers, C. F., 675.
 Rogers, C. H., 64, 174.
 Rogers, L. H., 580.
 Rogers, W. P., 248, 818.
 Rokhlina, M. L., 469.
 Roller, E. M., 14, 165.
 Rollins, M. A., 285.
 Romanoff, A. L., 608.
 Romney, V. E., 221.
 Roosevelt, F. D., 1, 289, 473.
 Roosevelt, F. D. (Mrs.), 2.
 Roosinov, P. G., 73, 74.
 Rose, D. H., 546.
 Rose, F., 144.
 Rose, W. G., 294.
 Rosen, H. R., 496.
 Rosenberg, L. R., 827.
 Rosenblum, L. A., 859.
 Rosendahl, E., 160.
 Rosendahl, R. O., 485.
 Rosene, H. F., 454.
 Rosenstiel, R. G., 502.
 Rosenwald, A. S., 541.
 Roskelley, R. W., 555.
 Ross, A. F., 71, 74, 212, 213.
 Ross, J. F., 418.
 Ross, O. B., 516.
 Ross, W. H., 21.
 Rosseau, J., 595.
 Roster, E. J., 132.
 Rost, C. O., 446.
 Roth, E. R., 79.
 Roth, L. F., 488.
 Roth, R. W., 785.
 Rothholz, E., 582.
 Rütth, A. de, 699.
 Rounds, M. B., 497.
 Roundy, Z. D., 246, 396.
 Routien, J. R., 357.
 Rowlands, I. W., 181.
 Rowley, H. H., 437.
 Roy, W. R., 369.
 Rozanova, M. A., 403.
 Rozman, D., 830.
 Ruben, S., 456.
 Rubin, H. L., 264.
 Rubin, M., 113, 806.
 Rubinstein, H. S., 140, 331, 382, 468.
 Rubtsov, G. A., 621.
 Rudolf, P. O., 355.
 Rueggesser, J. M., 414.
 Ruehle, G. D., 369, 370, 620, 642.
 Rufener, W. W., 680.
 Ruff, C. F., 159.
 Rufnerzo, P. G., 112.
 Rule, G. K., 165.
 Rumbold, C. T., 782.
 Rundle, C. H., 478, 556.
 Rundlett, B., 603.
 Ruppel, I. W., 522.
 Ruprecht, R. W., 619.
 Rusk, H. P., 653.
 Rusk, H. W., 789.
 Rusoff, L. L., 651, 652, 665, 802.
 Russell, E. W., 15.
 Russell, M. B., 160, 308, 340, 731.
 Russell, S., 830.
 Russell, W. C., 443, 805.
 Rust, L. O., 121.
 Rutledge, P. C., 258.
 Ruys, A. C., 817.
 Ruysen, R. G., 580.
 Ruzek, C. V., 730.
 Ruzinov (Roozinov), P. G., 73, 74.
 Ryall, A. L., 194.
 Ryan, J. H., 159.
 Rybatschenko, M. I., 460.
 Ryker, T. C., 752, 772.
 Rynearson, E. H., 424.
 Ryu, E., 529.
 Rzarcv, M. M., 327.
 Sabrosky, C. W., 88, 227, 510, 647.
 Sacco, R. A., 369.
 Sackman, R. F., 471.
 Sadasivan, T. S., 207.
 Sadr, M. M. El, 856.
 Saba, K. C., 128.
 Sahai, L., 665.
 St. John, H., 315.
 St. John, J. L., 477, 516, 527.
 St. John, N., 688.
 Saker, G., 133.
 Salas, L. A., 646.
 Salisbury, G. W., 327, 518, 749, 825.
 Salisbury, J., Jr., 677.
 Salmon, W. D., 277.
 Salo, J. V., 159, 587.
 Salt, G., 649.
 Salter, L. C., 552.
 Salter, R. M., 356, 432, 549.
 Saltykovsky, A. I., 315.
 Sammet, K., 317.
 Sampaio Fernandes, J., 645.
 Sampson, K., 171.
 Samson, R. W., 777.
 Samuels, L. T., 334.
 San Agustin, F., 405.
 Sanborn, J. R., 558.
 Sanborn, R., 804.
 Sanctuary, W. C., 828.
 Sanders, D. A., 665.
 Sanders, K. B., 470, 542.
 Sandhu, S. S., 364.
 Sandin, E. B., 395.
 Sando, C. E., 294.
 Sando, L., 354.
 Sandoz, M. F., 783.
 Sanford, G. B., 67, 211.
 Sanford, L., 587.
 Sanford, W. E., 359.
 Santos, P. R., 370.
 Sapre, S. N., 800.
 Saraiva, A. C., 85.
 Saret, H. P., 860.

- Sargent, M. C., 457.
 Sarle, C. F., 11.
 Sasman, L. M., 121.
 Sass, J. E., 190.
 Sassaman, H. L., 441.
 Sater, L. B., 285.
 Satina, S., 169, 173.
 Sato, A., 529.
 Sattur, A., 363, 364.
 Satterfield, G. H., 234.
 Saunders, F., 818.
 Savage, E. F., 765.
 Savage, E. S., 656.
 Savage, Z., 677.
 Saville, T., 302.
 Savur, S. K., 11.
 Sawin, P. B., 603, 747.
 Sawyer, C. B., 539.
 Sawyer, S. D., 695.
 Sax, K., 324, 326.
 Sayre, A. N., 542.
 Sayre, C. B., 166, 193, 346, 633, 735.
 Sayre, J. D., 340, 341.
 Sayre, N., 281.
 Scales, A. L., 504.
 Scales, F. M., 524.
 Scaramuzza, L. C., 510, 788.
 Scarborough, H., 714.
 Scarseth, G. D., 313, 356, 449, 631, 735.
 Scarth, G. W., 743.
 Schaars, M. A., 119.
 Schacht, H., 143.
 Schaefer, C. W., 502.
 Schaffer, H. G., 471.
 Schaffer, J. M., 664.
 Schallie, P. J., 237, 389, 655.
 Schall, H. D., 788.
 Schalm, O. W., 108.
 Schantz, E. J., 413.
 Schilzlein, C., 424.
 Schechtman, A. M., 325.
 Scheffer, T. C., 639.
 Scheib, B. J., 521.
 Scheidenhelm, E. C., 519.
 Schell, I. I., 12.
 Schermerhorn, L. G., 489, 763.
 Scheunert, A., 132, 707.
 Scheutle, H., 277.
 Schiffman, H. G., 678.
 Schiller, A. A., 280.
 Schinagl, J., 144, 481.
 Schindel, L., 442.
 Schlotthauer, C. F., 671.
 Schmauss, A., 444.
 Schmidt, C. L. A., 439.
 Schmidt, I. G., 408.
 Schmitz, H., 828.
 Schneider, B. A., 379.
 Schneider, B. H., 382.
 Schneider, C. L., 170, 319.
 Schneider, G. W., 53.
 Schneider, H. A., 276.
 Schnell, R. L., 74.
 Schnetzler, E. B., 431.
 Schoene, W. J., 506.
 Schoening, H. W., 111, 664, 824.
 Schofield, F. W., 820.
 Scholes, J. C., 748.
 Schott, R. G., 35, 382.
 Schouten, G. B., 497.
 Schrader, A. L., 622.
 Schrader, G. A., 439.
 Schroeder, C. A., 483.
 Schroeder, M. F., 740.
 Schroeder, R. A., 345.
 Schrupf, W. B., 681.
 Schuette, H. A., 294.
 Schuh, J., 790, 791.
 Schulman, E., 302, 480, 588.
 Schulte, K. E., 440.
 Schultz, A. S., 727.
 Schultz, E. S., 629.
 Schultz, J., 419.
 Schultz, T. W., 262, 263, 548, 689.
 Schulz, J. A., 151, 176, 231, 238.
 Schumacher, A. E., 300.
 Schumacher, F. X., 63.
 Schuphan, W., 699.
 Schuster, G. L., 40, 143.
 Schwabe, R. L., 606.
 Schwartz, L. H., 537, 604.
 Schwartz, H., 676.
 Schwartz, C. D., 477, 478, 556.
 Schwarz, E. R., 430.
 Schweiler, L. H., 835.
 Schwemmle, J., 322.
 Schwendiman, A., 472.
 Schwendiman, J. L., 477.
 Schwenger, R. B., 840.
 Scofield, C. S., 310.
 Scott, C. L., 862.
 Scott, D. H., 56.
 Scott, F. M., 169.
 Scott, H. M., 92, 236.
 Scott, J. P., 402.
 Scott, L. B., 48.
 Scott, T. G., 217, 374, 500, 826.
 Scott Blair, G. W., 813.
 Scott Watson, H. M., 810.
 Scrivner, L. H., 109.
 Scudi, J. V., 583, 856.
 Seaber, W. M., 8.
 Sealey, J. L., 833.
 Scallock, R. R., 572.
 Searis, E. M., 503, 642.
 Seath, D., 393.
 Seath, D. M., 34, 519, 752, 809, 810.
 Seaton, H. L., 479.
 Seaton, L., 503, 784.
 Sebrell, W. H., 276, 563, 858.
 Secret, J. P., 795.
 Sedky, A., 300, 724.
 Seegal, B. C., 630.
 Seeler, E. V., Jr., 23.
 Seely, C., 471.
 Seely, C. L., 750.
 Segaloff, A., 335.
 Seghetti, L., 110.
 Seitz, C. B., 257.
 Self, F. W., 474.
 Sell, H. M., 619.
 Sellards, A. W., 402.
 Selye, H., 39.
 Semenik, G., 185, 205, 257.
 Sen, P. B., 425.
 Setterstrom, C., 456.
 Seufferle, C. H., 551.
 Shadwick, G. W., Jr., 658.
 Shaffner, C. S., 467.
 Shahan, M. S., 538, 664.
 Shakhunian, R. M., 386.
 Shalucha, B., 169, 741.
 Shands, H. L., 472.
 Shannon, R. C., 510.
 Shanor, L., 65.
 Shapovalov, M., 75.
 Sharp, A. L., 302.
 Sharp, D. G., 402.
 Sharp, M. A., 542.
 Sharp, P. P., 243, 432, 524, 659.
 Shaughnessy, H. J., 403.
 Shaw, A. O., 98, 104.
 Shaw, B., 307.
 Shaw, C. F., 161.
 Shaw, F. R., 229.
 Shaw, H. O., 677.
 Shaw, J. C., 242, 332, 519.
 Shaw, J. H., 422.
 Shaw, J. K., 762.
 Shaw, K. J., 74.
 Shaw, L., 768.
 Shaw, W. M., 22, 445.
 Shay, H., 332, 749.
 Shea, K. G., 804.
 Shealy, A. L., 604, 651, 665.
 Shear, G. M., 74.
 Shear, S. W., 631, 688.
 Sheard, G. F., 323.
 Shearer, H. B., 283.
 Shearer, P. S., 176, 231, 233, 262.
 Shedd, C. K., 115, 185, 257.
 Sheets, O., 412, 430, 556.
 Sheldon, C. H., 574.
 Sheldon, A. J., 538.
 Sheldon, W. H., 676.
 Shen, C. I., 208.
 Shenberger, L. C., 865.
 Shepard, P. H., 622.
 Shepardson, C. N., 520.
 Shepardson, W. B., 739.
 Shepherd, A. D., 744.
 Shepherd, D. R., 205.
 Shepherd, G. S., 151, 182.
 Shepherd, J. B., 400.
 Sherbakoff, C. D., 75, 487, 768.
 Sherman, F., 84.
 Sherman, G. D., 431.
 Sherman, H. C., 565.
 Sherman, J. M., 33, 398, 520.
 Sherman, L. K., 302, 732.
 Sherman, R. W., 548.
 Sherman, W. C., 564.

- Sherwood, D. H., 240
 Shettles, L. B., 36, 713.
 Shevkcnek, W., 793.
 Shickele, R., 262.
 Shields, J. B., 127.
 Shields, W. P., 570.
 Shimotori, N., 573.
 Shinn, E. H., 680.
 Shinnors, L. H., 171.
 Shiokawa, Y., 529.
 Shippy, W. B., 629.
 Shirk, F. A., 786.
 Shirk, H. G., 170, 718.
 Shirley, H. L., 202.
 Shive, J. W., 28, 107, 737.
 Shope, R. E., 823.
 Shotwell, R. L., 505.
 Shreve, E. B., 159.
 Shreve, F., 159.
 Shrimpton, E. A. G., 710.
 Shuart, C. E., 519.
 Shuey, G. A., 437.
 Shulkcum, E., 303.
 Shall, W. E., 786.
 Shultis, A., 833.
 Shuman, H. H., 414.
 Shunk, I. V., 82.
 Shute, P. G., 877.
 Sibbitt, L. D., 47, 70, 246, 506.
 Sibuya, Y., 528.
 Sideris, C. P., 64.
 Siegler, E. H., 87.
 Sieling, D. H., 631, 729.
 Sievers, A. F., 59.
 Sievers, F. J., 864.
 Sievert, C. W., 383.
 Silberberg, M., 467.
 Silberberg, R., 467.
 Silberschmidt, K., 213, 358.
 Silberstein, H. E., 572.
 Silkett, R. J., 679.
 Silver, J., 639.
 Silverman, M., 394.
 Sims, P. R., 374.
 Siminovich, D., 27.
 Simmonds, P. M., 632.
 Simmons, C. S., 590.
 Simmons, P., 501.
 Simmons, S. W., 217, 798.
 Simmons V. L., 382.
 Simms, H. D., 276.
 Simon, P. N., 724.
 Simonson, R. W., 100, 312, 449.
 Simpson, D. M., 31, 210.
 Simpson, G. W., 222, 342, 609, 629, 642.
 Simpson, M. E., 179, 297, 469.
 Simpson, W. M., 816.
 Sinclair, W. B., 369, 623, 785.
 Singleton, H. P., 445, 471, 516, 556.
 Slinnott, E. W., 169, 740.
 Sipe, F. F., 315.
 Sipe, G. E., 551.
 Sipos, F., 321.
 Sirny, E., 522.
 Sjollesma, D., 806.
 Skaptasori, J. B., 643, 776.
 Skankin, F. D., 453.
 Skolding, A. D., 455.
 Skelton, F. M., 520, 526.
 Skinner, H. T., 62.
 Skinner, J. J., 357.
 Sklar, A. L., 9.
 Sklow, J., 750.
 Skoglund, W. C., 95, 808.
 Skok, J., 772.
 Skoog, F., 26, 170, 172.
 Slade, H. D., 461.
 Slagvold, P. L., 118.
 Slanetz, L. W., 400.
 Slesinski, F. A., 806.
 Sloan, H. J., 235.
 Sloan, J. E. N., 669.
 Sloan, L. L., 565.
 Sloan, L. M., 92.
 Slocum, R. R., 237.
 Smlerton, M. J., 361.
 Smiley, K. L., 398.
 Smirnov, A. I., 456.
 Sniff, A. J. H., 741.
 Smith, A., 308.
 Smith, A. deG., 137.
 Smith, A. H., 271, 560, 852.
 Smith, A. L., 364, 768.
 Smith, C. C., 87.
 Smith, C. L., 502.
 Smith, C. M., 785.
 Smith, C. O., 77.
 Smith, C. W., 785, 786.
 Smith, D., 339.
 Smith, D. C., 471.
 Smith, E. H., 227.
 Smith, E. L., 270, 597.
 Smith, E. V., 499.
 Smith, F. B., 589, 608, 731, 732, 739.
 Smith, F. F., 215.
 Smith, F. R., 238.
 Smith, F. V., 831, 834.
 Smith, G. F., 745.
 Smith, G. L., 504.
 Smith, H. P., 574.
 Smith, H. R., 382.
 Smith, H. S., 47, 217.
 Smith, H. V., 130.
 Smith, H. W., 787.
 Smith, I., 460.
 Smith, J. A. R., 810.
 Smith, J. B., 6.
 Smith, J. G., 198.
 Smith, J. H. C., 171, 457, 663, 801.
 Smith, K. A., 566.
 Smith, K. M., 358, 789.
 Smith, L., 750.
 Smith, L. E., 520.
 Smith, L. F., 325, 624.
 Smith, L. J., 542.
 Smith, M. C., 180, 186, 281, 854.
 Smith, M. G., 834.
 Smith, M. I., 817.
 Smith, N. R., 312.
 Smith, O. F., 209.
 Smith, P. A., 33.
 Smith, P. E., 607.
 Smith, R. A., 689.
 Smith, R. C., 84.
 Smith, R. E., 78, 487, 635.
 Smith, R. H., 650.
 Smith, R. L., 42.
 Smith, R. M., 653.
 Smith, S. E., 657, 747.
 Smith, S. G., 91, 423.
 Smith, T. E., 74.
 Smith, T. L., 842.
 Smith, T. O., 23.
 Smith, V. R., 238.
 Smith, W. H., 346, 352.
 Smith, W. K., 471, 771.
 Smith, W. O., 308.
 Smith, W. R., 809.
 Smith, W. W., 502.
 Smock, R. M., 778.
 Smucker, S. J., 782.
 Smuis, D. B., 232, 233, 391.
 Snapp, O. I., 505, 793.
 Snapp, R. R., 382, 653.
 Snedecor, G. W., 182, 263.
 Sneider, M. E., 333.
 Snell, E. E., 235, 442, 807, 857.
 Snell, G. D., 747.
 Snell, M. G., 801.
 Snell, W. H., 637, 780.
 Snelling, C. M., 690.
 Snelling R. O., 769.
 Snieszko, S. F., 32.
 Snipes, B. T., 87.
 Snow, A. G., Jr., 355, 356, 435.
 Snow, S. B., 64.
 Snyder, E., 197.
 Snyder, G. B., 189, 762.
 Snyder, J. C., 477.
 Snyder, R. S., 809.
 Snyder, W. E., 28.
 Sober, H. A., 272, 274, 275.
 Soderwall, A. L., 180, 603, 750.
 Sokoloff, V. P., 781, 791.
 Solcy, M. H., 271.
 Solomon, M. L., 180, 331, 408.
 Sommer, A. L., 445.
 Sommer, H. H., 394, 520.
 Soni, B. N., 88, 644.
 Sonneborn, T. M., 784.
 Soraci, F. A., 83.
 Sorber, D. G., 155.
 Sorenson, C. J., 616.
 Sotola, J., 232, 516.
 Souter, A. W., 10, 715.
 Southern, H. N., 639.
 Southwick, L., 762.
 Sowell, D. F., 651.
 Speck, M. L., 525.
 Spector, H., 136.
 Spedding, F. H., 151.
 Speh, C. F., 156, 283.

- Speidel, T. D., 573
 Spelman, A. F., 809
 Spencer, E. I., 495, 777.
 Spencer, J. N., 381.
 Spencer, J. T., 33
 Spencer, L., 393.
 Spencer, V. E., 445, 527
 Sperling, G., 418, 848
 Spiegelberg, C. H., 155.
 Spielman, A., 39, 519.
 Spier, E., 126.
 Spies, T. D., 130, 133, 138,
 252, 274, 414, 421.
 Spillsbury, R. H., 591.
 Spindler, L. A., 402.
 Spink, W. W., 666.
 Spinks, G. T., 350, 351.
 Spitzer, E. H., 539.
 Spoehr, H. A., 171.
 Sponsler, O. L., 453.
 Sprague, G. F., 151, 185, 205
 Sprague, H. B., 108
 Sprague, R., 60, 204
 Spray, R. S., 460.
 Sproat, B. B., 201.
 Spurlock, A. H., 677.
 Spurrell, W. R., 333.
 Spurway, C. H., 311.
 Sreenivasan, A., 16
 Stacy, S. V., 185.
 Stacy, W. H., 265.
 Stahl, A. L., 619.
 Stahl, W. H., 530, 531.
 Stains, G. S., 217.
 Stair, E. C., 340.
 Stakman, E. C., 491.
 Stamborg O. E., 580, 582
 691.
 Stanbery, S. R., 133.
 Standen, J. H., 205.
 Stanley, A. J., 604.
 Stanley, A. R., 460.
 Stanley, O. B., 314.
 Stanley, W. M., 364, 400, 776
 Stanley, W. W., 226.
 Stanton, E. F., 651.
 Stanton, T. R., 341.
 Staple, W. J., 591.
 Staples, C. H., 510.
 Starin, W. A., 32.
 Stark, C. N., 32, 521.
 Stark, W. H., 33.
 Starkey, L. V., 92.
 Starr, G. H., 362, 494.
 Starr, L. S., 821.
 Starr, M. P., 158.
 Staten, G., 756.
 Stead, B., 520.
 Stearns, G., 573.
 Stearns, L. A., 84, 375, 511.
 Stedronsky, V. L., 545.
 Steel, G. F., 238.
 Steenbjerg, F., 208.
 Steenbock, H., 279, 280.
 Stein, C. D., 670, 825.
 Steinbauer, G. P., 477.
 Steinberg, R. A., 596.
 Stelner, G., 370.
 Steiner, H. M., 507, 513, 793.
 Steiner, L. F., 789.
 Steinmetz, F. H., 170.
 Stene, A. E., 196, 200.
 Stephens, M., 814.
 Stephens, J. L., 603.
 Stephenson, R. B., 170.
 Stephenson, R. E., 732.
 Stevens, F. D., 608.
 Stevens, H. E., 637.
 Stevens, J. W., 442.
 Stevens, K. R., 165.
 Stevens, L. A., 12.
 Stevens, N. B., 204, 206, 360,
 487, 740.
 Stevens, O. A., 485, 751.
 Stevens, R., 433.
 Stevens, R. D., 257.
 Stevens, R. H. W., 48.
 Steward, F. C., 455.
 Stewart, D. F., 108.
 Stewart, G., 265
 Stewart, G. F., 176, 231.
 Stewart, R., 445.
 Stewart, W. L., 669.
 Stickley, A. R., 303.
 Stiebeling, H. K., 270
 Stier, H. L., 714.
 Stier, T. J. R., 453.
 Stiles, G. W., 532, 815.
 Stiles, K. A., 641.
 Stiles, M., 641.
 Stiles, W., 465.
 Stinson, T. B., 40.
 Stirrett, G. M., 785.
 Stitt, R. E., 343.
 Stoa, T. E., 47, 188, 738.
 Stockton, A. B., 820.
 Stoddard, E. M., 367.
 Stoddard, L. A., 614.
 Stoekeler, J. H., 587.
 Stochr, J. A., 382.
 Stokes, A. P. D., 314, 446.
 Stokes, F. H., 532.
 Stokes, I. E., 41.
 Stokes, J. L., 734.
 Stokes, W. E., 608.
 Stone, G. E., 288.
 Stone, G. M., 31.
 Stone, M. W., 512.
 Stone, P. C., 502.
 Stone, R. G., 303.
 Stone, R. W., 174.
 Stone, S., 426.
 Stone, W. S., 527, 667, 816
 Storey, W. B., 190.
 Storie, R. E., 303, 351.
 Story, R. V., 698.
 Stott, L. H., 267.
 Stout, A. B., 602.
 Stout, M., 188.
 Stout, P. R., 306, 321.
 Stout, R. E., 238, 244.
 Stovall, J. C., 159.
 Straib, W., 359, 491.
 Strain, H. H., 171.
 Straloch, E. A., 500
 Strand, A. B., 479.
 Straughn, W. R., Jr., 32
 Streich, G., 179.
 Stringfield, G. H., 186
 Stroman, G. N., 601.
 Strommen, A. M., 471, 472.
 Strong, F. C., 65, 205, 216
 Strong, F. M., 275.
 Strong, L. C., 603, 746
 Strong, M. C., 65.
 Strong, R., 733.
 Struck, H. C., 280.
 Struckmeyer, E. E., 49, 458
 Stuart, E. O., 540, 827.
 Stubb, E. L., 817.
 Stuckey, I. H., 170.
 Stuhr, E. T., 170.
 Stultz, H. T., 785.
 Stuntz, S. C., 286.
 Sturgis, C. C., 694
 Sturgle, M. B., 752.
 Sturkie, D. G., 470.
 Sturkie, P. D., 404.
 Subrahmanyam, V., 514
 Sudds, R. H., 54.
 Snit, R. F., 215, 368.
 Sullivan, J. T., 492.
 Sullivan, M., 415
 Sullivan, M. X., 234.
 Sullivan, R. A., 298, 384.
 Sullivan, W. N., 220, 226
 Sumida, D., 181, 190
 Summerland, S. A., 769
 Summers, F. M., 784
 Sumner, J. B., 274.
 Sumner, R. J., 274
 Sumpstine, W. J., 63.
 Sunderville, E. J., 527.
 Sunderson, C. A., 628.
 Sunzoff, V., 460
 Supplee, G. C., 520, 569, 658.
 Surface, H. A., 576.
 Sutherland, M. L., 18.
 Sutton, D. C., 835.
 Sutton, T. S., 328, 519, 520.
 Svetoslavov, E., 179.
 Swain, R. B., 376.
 Swales, W. E., 604.
 Swallen, J. R., 171, 471, 710
 Swaminathan, M., 441.
 Swanback, T. R., 759, 760.
 Swank, G. R., 220.
 Swanson, A. F., 40.
 Swanson, C. O., 5, 40.
 Swanson, C. P., 324, 718.
 Swanson, E., 519.
 Swanson, E. W., 330, 657.
 Swanson, L. E., 607.
 Swanson, P. P., 268.
 Swanson, R. C., 472.
 Swanson, R. W., 809.
 Swanson, W. R., 40.
 Swartley, J., 201.
 Swartwout, H. G., 215.
 Sweet, J. E., 38.
 Sweetman, H. L., 87.

- Sweetman, M. D., 691.
 Swenk, M. H., 432.
 Swenson, G. A., 303, 590.
 Swenson, S. P., 757.
 Swenson, T. L., 237.
 Sweet, W. W., 39, 239.
 Swezey, O. H., 787.
 Swift, C. E., 204.
 Swingle, H. S., 499.
 Swingle, M. C., 87, 218, 219.
 Swingle, W. T., 87, 170.
 Swinney, R. E., 399.
 Switzer, R. G., 299.
 Sydenstricker, V. P., 858.
 Sykes, J. F., 241, 392.
 Symons, T. B., 286.
 Syverson, J. T., 254, 403.
 Tachibana, 190.
 Taggart, W. G., 718.
 Takahashi, M., 181, 190.
 Takahashi, W. N., 325.
 Takimoto, S., 213, 214.
 Talbot, N. B., 126.
 Tallafiero, W. T. L., 431.
 Tallafiero, W. H., 784.
 Talley, P. J., 492.
 Tam, R. K., 452.
 Tamhane, R. V., 15.
 Tamura, T., 529.
 Tanada, 160.
 Tanaka, K., 529.
 Tanaka, U., 528, 529.
 Tanner, F. W., 124, 156, 693.
 Tanner, M., 603.
 Tapke, V. F., 69.
 Tarassuk, N. P., 394, 525.
 Tarshis, M. S., 787.
 Tate, H. D., 640, 799.
 Tatman, E. C., 193.
 Tattersfield, F., 641.
 Tatum, L. A., 185.
 Tauber, O. M., 87.
 Taylor, A. L., 304, 305, 708.
 Taylor, A. R., 402.
 Taylor, C. A., 483, 712.
 Taylor, C. V., 453.
 Taylor, C. W., 784.
 Taylor, F. H. L., 10.
 Taylor, G., 724.
 Taylor, H. M., 100.
 Taylor, J. B., 113, 390.
 Taylor, L. V., Jr., 6.
 Taylor, L. W., 36.
 Taylor, M. H., 263.
 Taylor, M. J., 747.
 Taylor, M. W., 805.
 Taylor, R. W., 470.
 Taylor, W. P., 499.
 Tedrow, J. C. F., 162.
 Tehon, L. B., 78, 218.
 Teichert, L. P., 520.
 Telford, H. S., 83, 218, 219, 502, 506.
 Telford, I. R., 426.
 Temperton, H., 805.
 Temple, C. E., 368.
 Templeman, W. G., 599.
 Templeton, G. S., 639.
 Terrill, C. E., 327.
 Terrill, H. V., 500.
 Tervet, I. W., 632.
 Terzian, L. A., 404.
 Tetley, J. H., 823.
 Tetreau, E. D., 120.
 Thacker, E. J., 234.
 Thaler, H., 440.
 Thaller, H. I., 664.
 Thalmann, R. R., 432.
 Tharp, W. H., 634, 708.
 Thayer, C. L., 189, 762.
 Thayer, S. A., 297, 427, 583.
 Theophilus, D. R., 809.
 Thewlis, J. D., 719.
 Thies, W. H., 762.
 Thimann, K. V., 26, 170, 322, 326, 598.
 Thom, C., 32, 208, 404.
 Thom, H. C. S., 302.
 Thomas, B. H., 151, 170, 231, 238.
 Thomas, F. L., 504.
 Thomas, I., 377, 641.
 Thomas, J. O., 820.
 Thomas, P. W., 159.
 Thomas, R. P., 732.
 Thomas, W., 348, 489, 742.
 Thomas, W. D., Jr., 498.
 Thomas, W. P., 204.
 Thompson, C. P., 382.
 Thompson, E. O., 372.
 Thompson, G. E., 81.
 Thompson, H. C., 191.
 Thompson, J. C., Jr., 359.
 Thompson, R. B., 808.
 Thompson, R. W., 785.
 Thompson, S. H., 262.
 Thompson, W. C., 804.
 Thompson, W. L., 506, 641, 642.
 Thompson, W. W., 104.
 Thomssen, E. G., 642, 787.
 Thornberry, H. H., 357, 635.
 Thorne, D. W., 102, 592.
 Thornley, H. F., 646.
 Thornthwaite, C. W., 302, 303.
 Thornton, B. J., 616, 761.
 Thornton, G. D., 865.
 Thornton, H. R., 395.
 Thornton, N. C., 456, 537.
 Thorp, F., Jr., 253.
 Thorp, J., 161.
 Thorp, W. T. S., 95, 838.
 Threlkeld, W. L., 609.
 Throckmorton, R. I., 40, 47, 753.
 Thurston, L. M., 651.
 Tice, G. A., 319.
 Tidmore, J. W., 718.
 Tiedjens, V. A., 480, 592.
 Tiemann, H. D., 485.
 Tiffany, H. S., 762, 769.
 Tilford, P. E., 371.
 Tiller, L. W., 75.
 Tillson, A. H., 170.
 Timberlake, P. H., 380, 511.
 Timmings, E. F., 424.
 Timmons, F. L., 40.
 Timonin, M. I., 69.
 Thum, E. C., 708.
 Tindale, G. B., 353.
 Tingey, D. C., 341, 618.
 Tinley, J. M., 686.
 Tippet, R. L., 495.
 Tisdale, H. B., 470, 487.
 Tisdale, W. B., 629.
 Tissot, A. N., 641.
 Titus, H. W., 97, 388.
 Tobey, E. R., 479, 593, 629.
 Tobin, C. E., 336.
 Tobin, L. C., 346.
 Tocantins, L. M., 140.
 Todd, F. E., 502.
 Todhunter, E. N., 278, 556.
 Toews, J. L., 750, 769, 800, 828.
 Toit, B. A. du, 391.
 Tolman, B., 188.
 Tomhave, A. H., 95, 100, 808.
 Tomlinson, W. E., Jr., 787.
 Tompkins, C. M., 215, 371, 777.
 Toole, E. H., 774.
 Toole, E. K., 64, 628, 638.
 Toole, V. K., 754, 774.
 Torrio, J. H., 471, 472.
 Tosa, K., 528.
 Totttingham, W. E., 472, 595, 598, 692.
 Toulouse, J. H., 523.
 Townsend, G. E., 619, 629.
 Tozier, M. M., 590.
 Tracy, P. H., 102, 247, 397.
 Traub, H. P., 198.
 Traum, J., 533, 817.
 Travis, C. W., 404.
 Traylor, J. A., 357.
 Trebler, H. A., 524.
 Trehan, K. N., 88.
 Trenk, F. B., 485.
 Trent, J. A., 323.
 Trentin, J. J., 333.
 Tressler, C. J., 153.
 Tressler, D. K., 124, 134, 154, 155, 299, 564, 571, 848.
 Trewartha, G. T., 841.
 Trimberger, G. W., 327.
 Trout, G. M., 103, 526, 658.
 Trullinger, R. W., 288.
 Truog, E., 305, 446, 472, 522.
 Trussell, R. E., 532.
 Tsai, C., 414.
 Tsubota, 231.
 Tucker, C. M., 214, 777.
 Tucker, J., Jr., 407.
 Tucker, L. R., 724.
 Tucker, M. B., 718.
 Tufts, W. P., 214, 482.
 Tull, Y., 529.
 Tukey, H. B., 195, 764.
 Tullis, E. C., 70, 211.

- Tunncliffe, E. A., 535.
 Turl, L. H., 429.
 Turnage, W. V., 159.
 Turner, C. D., 604.
 Turner, C. W., 101, 333, 335, 391, 519, 523, 607, 657.
 Turner, E. L., 786.
 Turner, E. M., 70.
 Turner, J. P., 784.
 Turner, N., 508, 644.
 Turnipseed, G. F., 340.
 Turrell, F. M., 64, 369, 623.
 Tutbill, C. S., 774.
 Tutt, J. B., 401.
 Twiehaus, M. J., 104.
 Twinn, C. R., 785, 786.
 Tycan, G. W., 472.
 Tyler, J., 631.
 Tyler, L. J., 638.
 Tyner, E. H., 304, 438.
 Tyner, L. E., 365.
 Tysdal, H. M., 614.
 Tytell, A. A., 596.
 Tyzzer, E. E., 402.

 Uesugi, S., 529.
 Uhland, R. H., 591.
 Ullstrup, A. J., 492.
 Ulrey, O., 687.
 Ulrich, A., 322.
 Ulrich, H. P., 865.
 Umbrett, W. W., 32, 784.
 Underbjerg, G. K. L., 327, 394.
 Underwood, J. K., 470.
 Unna, K., 856.
 Uphof, J. C. T., 171.
 Upholt, W. M., 84.
 Uppal, B. N., 637.
 Upshall, W. H., 763.
 Urquhart, N. R., 830.
 Useem, J., 841.
 Uselman, J. J., 50.
 Usinger, R. L., 500.
 Utter, L. G., 785.

 Vall, G. E., 92, 121.
 Valenzuela, A., 411.
 Vallean, W. D., 72, 358, 364, 405, 496.
 Van Alstyne, A., 375.
 van Beynum, J., 242, 243.
 Vandecaveye, S. C., 445.
 van der Goot, P., 86.
 van der Plank, J. E., 479, 479.
 Van Dersal, W. R., 499.
 van der Weij, H. G., 212.
 Van Doren, C. A., 337.
 van Dyke, H. B., 603.
 Van Es, L., 539, 664.
 Van Etten, R. B., 647.
 Van Horn, C. W., 59.
 VanLandingham, A. H., 382, 660.
 Van Lanen, J. M., 64, 66.
 Van Liere, E. J., 271.
 van Niel, C. B., 173, 453.
 van Oordt, G. J., 468.

 van Overbeek, J., 160, 319.
 Van Roedel, H., 113, 664, 815.
 Van Schalkwijk, H. A. D., 85.
 Vansell, G. H., 228, 380.
 Van Valkenburg, S., 844.
 Van Voorhis, S. N., 105, 562.
 van Wyk, G. F., 479.
 Vardiman, P. H., 255.
 Varley, G. C., 798.
 Varney, R. F., 606.
 Vaughan, E. K., 204.
 Vaughan, R. E., 628.
 Vaughn, R. H., 33, 370.
 Vawter, L. R., 527.
 Veatch, J. O., 590.
 Vehlow, E. L., 524.
 Veihmeyer, F. J., 732.
 Veldhuis, M. K., 556.
 Venables, E. P., 502.
 Vereen, T. L., 61.
 Verma, G. S., 370.
 Verma, P. M., 644.
 Verona, O., 497.
 Verrall, A. F., 81.
 Vervoort, H., 817.
 Verzar, F., 420.
 Vesey-Fitzgerald, D., 379.
 Veval, E. J., 377.
 Vicari, E. M., 747.
 Vickery, H. B., 270, 292.
 Vieg, J. A., 121.
 Vilter, R. W., 138, 414, 421.
 Vincent, C. L., 471, 477.
 Vincent, R. H., 791.
 Vinson, C. G., 595.
 Virgin, W. J., 357, 769.
 Visser, S. S., 720, 844.
 Visscher, M. B., 242.
 Vivian, D. L., 502.
 Vogel, H., 7.
 Vogel, H. A., 294.
 Vogel, M. A., 489, 643.
 Vogel, O. A., 471.
 Vogler, K. G., 32, 734.
 Voit, F. B., 724.
 Volin, L., 679.
 Volk, G. M., 589, 590.
 Volk, G. W., 445.
 Volk, N. J., 445, 470, 594.
 Volker, J. E., 502.
 Volker, J. F., 419.
 Vollmer, E. P., 330, 603.
 Volodish, A. P., 459.
 Volz, E. C., 182, 190.
 Voorhees, R. K., 369, 629.
 Voorhies, E. C., 686.
 Voris, L., 234.

 Wachholder, K., 442, 861.
 Wada, I., 528.
 Wade, R. L., 762.
 Wade, H. W., 562.
 Wadleigh, C. H., 287, 708.
 Wadsworth, F. H., 625.
 Wadsworth, H. A., 160.
 Wadsworth, S. E., 477.
 Wagatsuma, S., 528.

 Wager, V. A., 368.
 Wagner, G. B., 505, 789.
 Wagner, K. H., 130, 132.
 Wagoner, C. A., 738.
 Wagstaff, A., 813.
 Walness, H., 520.
 Wainio, W. W., 234, 724.
 Waisman, H. A., 182.
 Waite, R., 814.
 Waite, W. C., 676.
 Wakeley, R. E., 263, 843.
 Wakeman, A. J., 292.
 Waksman, S. A., 18, 32, 168, 592.
 Waldbott, J. L., 64.
 Waldee, E. L., 182, 205.
 Waldron, L. R., 476, 760.
 Walkden, H. H., 499, 501.
 Walker, R. A., 497.
 Walker, G. P., 751.
 Walker, G. T., 11.
 Walker, H. A., 805.
 Walker, H. G., 375, 502.
 Walker, J. C., 360, 478, 488, 769, 773.
 Walker, M. N., 609, 629.
 Walker, M. S., 850.
 Walker, R. H., 717.
 Walker, W. P., 554.
 Walkley, J., 24.
 Wall, M. E., 444.
 Wallace, C. R., 91.
 Wallace, H. A., 2.
 Wallace, J. J., 182.
 Wallace, R. W., 42.
 Wallace, T., 350, 351.
 Waller, E. F., 82.
 Walley, G. S., 649.
 Wallis, R. L., 502.
 Walls, E. P., 102.
 Walrath, A. J., 680.
 Walter, E. V., 502, 647.
 Walter, J. M., 81.
 Walter, W. G., 174, 719.
 Waltman, C. S., 53.
 Walton, A., 37, 604.
 Walton, W. R., 501.
 Walts, C. W., 520.
 Wang, H., 467, 803.
 Wann, F. B., 191, 637.
 Warburton, C. W., 267.
 Ward, A. E., 239.
 Ward, C. A., 287.
 Ward, E. N., 747.
 Ward, H., 374.
 Ward, W. F., 604, 608, 651.
 Ware, F., 657.
 Ware, J. O., 42.
 Ware, L. M., 477, 485.
 Warkany, J., 465, 572.
 Warlick, P. W., 79.
 Warnke, H. E., 325.
 Warner, E. D., 428.
 Warner, E. W., 427.
 Warner, J. D., 475, 608.
 Warnock, G. M., 127.
 Warren, D. C., 36, 92, 236.

- Warwick, B. L., 35, 382, 604.
 Wasson, A. J., 103.
 Waterhouse, D. F., 89.
 Waterhouse, R. D., 159.
 Waterman, A. M., 201.
 Waterman, F. A., 325.
 Waters, N. F., 177, 406.
 Waters, P. C., 539, 641.
 Watkins, J. M., 40.
 Watkins, J. V., 197.
 Watson, D. W., 399.
 Watson, G. I., 378.
 Watson, H. M. S., 810.
 Watson, I., 473.
 Watson, I. A., 462.
 Watson, J. R., 629, 641, 642, 644.
 Watson, M. A., 490.
 Watson, N. L., 431.
 Watson, S. A., 170.
 Watson, S. J., 651.
 Watson, W., 828.
 Watterson, R. L., 603.
 Watts, B. M., 260.
 Watts, J. G., 84, 796.
 Watts, P. S., 400.
 Vaughn, R. K., 519.
 Weakley, C. E., Jr., 526, 660.
 Weatherby, E. J., 327, 519.
 Weatherby, J. H., 784.
 Weathers, E. K., 437.
 Weaver, J. G., 624.
 Weaver, L. A., 386.
 Weaver, L. E., 231, 247.
 Webb, B. H., 520.
 Webb, J., 499.
 Webb, L. W., Jr., 457.
 Webb, T. J., 583.
 Webber, L. G., 89.
 Weber, A. D., 92, 94.
 Weber, A. L., 52, 53.
 Weber, G. F., 629.
 Weber, G. R., 33.
 Webster, B. L., 86, 503.
 Webster, S. H., 642.
 Weckel, K. G., 660.
 Weddle, C. L., 60.
 Weedon, F. R., 456.
 Weeks, M. E., 21.
 Wegner, M. I., 100.
 Wehr, E. E., 114.
 Weidman, R. H., 625.
 Weigand, C. G., 703.
 Weigel, C. A., 638.
 Weining, E. M., 339, 473.
 Weij, H. G. van der, 212.
 Weillbaecher, J. O., Jr., 106.
 Weimer, J. L., 768.
 Weinberg, B. P., 303.
 Weindling, R., 65, 768.
 Weinstock, H. H., Jr., 440.
 Weirether, F. J., 534.
 Weiser, H. H., 814.
 Weiss, F., 201, 204, 357, 768.
 Weiss, H. B., 83.
 Weiss, M. G., 182.
 Weiss, S., 567.
 Weitzell, E. C., 831.
 Welch, D. S., 408.
 Welch, L. R., 44.
 Weld, W. A., 258.
 Weller, D. M., 459.
 Wellington, R., 196, 765.
 Wellman, F. L., 74.
 Wellman, H. R., 681, 682.
 Wells, J. G., Jr., 235, 657.
 Welsh, M., 532.
 Welton, F. A., 616.
 Wendt, H., 855.
 Wene, G., 792.
 Wenger, L. E., 40, 340.
 Wennerström, B., 100.
 Went, F. W., 323, 453, 602.
 Wenzel, L. K., 302, 542.
 Wenzl, H., 66, 460.
 Werkman, C. H., 7, 68, 151, 173, 174, 238, 293, 296, 297, 326, 394, 461, 659.
 Werner, G. M., 178, 327.
 Werner, H. O., 187.
 Wertz, A. W., 845.
 Wessely, F. v., 606.
 Wesson, L. G., 93.
 West, A. S., Jr., 227.
 West, E., 171, 629, 665, 828.
 West, H. O., 234.
 West, N., 299.
 West, N. S., 370.
 West, P. M., 19, 636.
 West, R., 388.
 West, W. A., 552.
 Westenbrink, H. G. K., 8.
 Wester, R. E., 774.
 Westerdijk, J., 66.
 Westerfield, C., 112.
 Wetmore, R. H., 169.
 Whaley, W. G., 349.
 Wheatley, M. D., 499.
 Wheaton, E., 693.
 Wheeler, C. D., 725, 728, 757.
 Wheeler, E. J., 261.
 Wheeler, J. T., 121.
 Wheeler, K. E., 60.
 Wheeler, L. A., 119.
 Wheeler, L. C., 170.
 Wheeling, L. C., 23, 165, 312, 445, 446, 477, 593, 732.
 Whipple, G. H., 128, 413, 439.
 Whipple, O. C., 860, 488.
 Whitacre, W. R., 837.
 Whitaker, C. H., 747.
 Whitaker, T. W., 50, 347, 493.
 Whitcomb, W. D., 787.
 White, E. L., 604.
 White, G. E., 394.
 White, H. A., 118.
 White, H. E., 762.
 White, J. C., 520.
 White, J. W., 754.
 White, N. H., 378.
 White, P. R., 318.
 White, R. T., 512.
 White, W., 103.
 White, W. H., 386.
 White, W. N., 542.
 White, W. R., 288.
 Whitehair, C. K., 537.
 Whitehead, H. R., 413.
 Whitehead, M. R., 26.
 Whitehurst, V. E., Jr., 601.
 Whiteman, E. F., 122.
 White-Stevens, R. H., 48.
 Whitfield, C. J., 337.
 Whitford, N. B., 169.
 Whitlock, J. E., 104, 394.
 Whitman, D. W., 245.
 Whitmore, F. C., 433.
 Whittah, C. H., 98, 394.
 Whittaker, C. W., 6.
 Whittington, F. R., 511, 791.
 Whithworth, J., 520.
 Wiancko, A. T., 751, 758.
 Wiant, J. S., 798.
 Wickard, C. R., 2.
 Wickizer, V. H., 681.
 Wicks, L., 152.
 Widland, M. A., 809.
 Wiebe, G. A., 44.
 Wiedemer, A. P., 521.
 Wiegnerink, J. G., 420.
 Wiehe, P. O., 363.
 Wiese, A. C., 673.
 Wiggins, C. G., 568.
 Wigglesworth, V. B., 790.
 Wight, A. E., 604.
 Wildakas, W., 186.
 Wilbur, D. A., 84.
 Wilcke, H. L., 176, 231, 217, 268.
 Wilcox, A. N., 765.
 Wilcox, J. C., 351, 591.
 Wilcox, W. W., 262.
 Wilde, R. I., 60, 62.
 Wilde, S. A., 485, 738.
 Wilder, O. H. M., 801.
 Wiley, W. H., 653.
 Wiley, W. J., 681.
 Wilgus, H. S., Jr., 389, 806.
 Wilhelm, L. A., 516, 808.
 Wilkening, E. A., 689.
 Wilkinson, R., 205.
 Willard, F. W., 433.
 Willett, H. C., 12.
 Willhite, F. M., 445.
 Williams, C. B., 41, 642.
 Williams, C. F., 194.
 Williams, D. E., 516.
 Williams, E. B., 521.
 Williams, F. E., 844.
 Williams, G. E., 115.
 Williams, J. K., 800, 815.
 Williams, K. T., 314.
 Williams, P. C., 652.
 Williams, R. D., 152.

- Williams, R. J., 133, 319, 322, 440, 442, 741, 807.
 Williams, R. M., 473.
 Williams, R. R., 727.
 Williams, W. L., 397, 469.
 Williamson, J. T., 470.
 Williamson, M. B., 523.
 Williamson, P., 407.
 Williamson, P. S., 260.
 Willer, B. H., 329.
 Willis, G. C., 519.
 Willis, J. C., 461.
 Willis, L. G., 739.
 Willis, R. L., 191.
 Willison, R. S., 764.
 Willman, H. A., 518.
 Willman, J. F., 382.
 Wilm, H. G., 302.
 Wilmot, R. J., 619.
 Wilsie, C. P., 151, 182, 268, 613.
 Wilson, C., 740.
 Wilson, C. C., 499.
 Wilson, C. P., 117.
 Wilson, C. W., 710.
 Wilson, D. C., 711.
 Wilson, E. E., 215.
 Wilson, F. H., 790.
 Wilson, G. W., 393.
 Wilson, H. F., 503, 787.
 Wilson, H. J., 562.
 Wilson, H. L., 246, 521.
 Wilson, I. C., 843.
 Wilson, J. B., 32.
 Wilson, J. D., 479, 489.
 Wilson, J. G., 603.
 Wilson, J. H., 710.
 Wilson, J. K., 19, 174, 316.
 Wilson, J. L., 523.
 Wilson, J. W., 641, 642, 644.
 Wilson, M., 143, 363.
 Wilson, M. L., 1.
 Wilson, P. W., 25, 32, 452, 734, 735.
 Wilson, T. R. C., 630.
 Wilson, W., 330.
 Wilson, W. B., 740.
 Wilson, W. F., Jr., 752, 761.
 Wilson, W. K., 604.
 Wilson, W. O., 97, 113, 390.
 Wilster, G. H., 238, 243, 244, 245.
 Winburn, T. F., 376, 499, 505.
 Winchester, C. F., 331.
 Winer, L. H., 800.
 Wingard, S. A., 69, 76.
 Wingo, C. W., 88, 508.
 Winks, W. R., 252.
 Winn, H. F., 258.
 Winsor, C., 182, 263.
 Winsor, H. W., 589, 590.
 Winston, J. R., 58, 134, 154.
 Winter, A. G., 77, 359.
 Winters, E., 15.
 Winters, J., 709.
 Winters, J. C., 417.
 Winton, B., 390.
 Wise, G. W., 98.
 Wishart, F. J., 724.
 Wishart, G., 785.
 Wisnicky, W., 328, 384, 539.
 Wissing, P., 479.
 Wissmann, H. B., 706.
 Withrow, A. P., 29.
 Withrow, R. B., 29, 457.
 Witschi, E., 38.
 Witz, R. L., 545.
 Witzel, S. A., 522.
 Woessner, W. W., 277.
 Woltkewitsch, A. A., 179, 335.
 Woke, P. A., 226.
 Wolbach, S. B., 93.
 Wolberg, F. B., 238, 521.
 Wolcott, G. N., 220, 229.
 Wolf, J., 706, 708.
 Wolf, M. J., 170.
 Wolfanger, L. A., 14.
 Wolfe, A. C., 719.
 Wolfe, H. S., 187.
 Wolfe, J. M., 177.
 Wolff, S., 131.
 Wolman, I. J., 524, 692.
 Woltman, H. W., 574.
 Wood, A. A., 785.
 Wood, A. J., 33.
 Wood, H. G., 296, 297, 326.
 Wood, J. F., 623.
 Wood, J. I., 769.
 Wood, M., 269.
 Wood, R. W., 702.
 Woodbury, G. W., 761, 828.
 Woodcock, E. F., 460.
 Woodhouse, E. D., 30.
 Woodhouse, W. W., Jr., 184.
 Woodman, H. E., 517.
 Woodroof, J. G., 693, 740, 765.
 Woodrow, A. W., 91, 501, 798.
 Woodruff, C. M., 305.
 Woodruff, H. B., 18, 32, 592.
 Woodruff, L. L., 784.
 Woods, A. F., 723.
 Woods, E., 809, 815, 855.
 Woods, R. H., 121.
 Woodside, A. M., 646, 795.
 Woodside, G. L., 604.
 Woodward, C. R., 719.
 Woodward, C. R., Jr., 734.
 Woodward, E. G., 718.
 Woodward, R. W., 341.
 Woodward, T. E., 391, 409.
 Woodworth, R. N., 410.
 Wooldridge, A. J., 206.
 Woolley, D. W., 252, 440, 704.
 Worcester, J., 126.
 Worden, A. N., 106, 856.
 Work, R. A., 159, 184, 782.
 Work, S. H., 231, 238.
 Working, E. B., 5.
 Worley, C. L., 627, 740.
 Wormald, H., 778.
 Wort, D. J., 458.
 Worthen, E. L., 609.
 Worthing, H., 603.
 Worthley, H. N., 376, 507, 513, 793, 795.
 Wortis, H., 852.
 Wortzella, W. W., 175.
 Wrenshall, C. L., 594.
 Wright, A. H., 472.
 Wright, G., 800.
 Wright, I., 135.
 Wright, M. D., 138, 654, 711.
 Wright, N. C., 516.
 Wright, R. C., 411.
 Wright, T., Jr., 314, 784.
 Wu, C. H., 414.
 Wu, H., 425.
 Wyche, R. H., 758.
 Wyckoff, R. W. G., 105.
 Wyckoff, V. J., 554.
 Wyk, G. F. van, 478.
 Wylie, C. E., 521.
 Wyman, O. L., 362.
 Wynd, F. L., 169, 170.
 Wyss, O., 734, 735.
 Yale, M. W., 527.
 Yamamoto, S., 528.
 Yamashita, J., 528.
 Yanasawa, 268.
 Yang, E. F., 697.
 Yang, J. Y., 633.
 Yarnell, S. H., 176.
 Yarwood, C. E., 771.
 Yates, F., 171.
 Yeakel, M. H., 603.
 Yeglian, H. M., 729, 752.
 Yegna Narayan Aiyer, A. K., 810.
 Yerkes, G. E., 54.
 Yeshoda, K. M., 395.
 Yoder, L., 231.
 York, H. A., 470.
 Yoshida, E., 160.
 Yosikawa, M., 528.
 Yothers, M. A., 225, 784.
 Youden, W. J., 27, 344, 588.
 Young, A., 516.
 Young, H. E., 80.
 Young, H. Y., 64.
 Young, M. D., 828.
 Young, P., 523.
 Young, P. A., 602, 778.
 Young, R. E., 345, 762.
 Young, T., 821.
 Young, V. H., 634.
 Young, W. B., 718.
 Young, W. C., 180, 603.
 Youngken, H. W., 170.
 Younle, A. R., 827.
 Younkin, R. J., 302.
 Younkin, S. G., 205.
 Yu, E. H., 66.
 Yudin, A. M., 694.

- | | | |
|---------------------------------|--------------------------|---------------------------------|
| Zabluda, G. V., 459. | Zeck, E. H., 86. | Zimmerli, A., 443. |
| Zahn, K. V., 6. | Zehner, C. R., 522. | Zimmerman, C. C., 554. |
| Zahnley, J. W., 40. | Zeleny, L., 6. | Zimmerman, E. C., 91. |
| Zaitzeva, A. A., 173, 324, 457. | Zelle, M. R., 747. | Zimmerman, F. L., 578, 717. |
| Zaisen, K., 528. | Zeller, J. H., 382. | Zimmerman, P. W., 170, 740 |
| Zajic, E., 606. | Zeller, S. M., 214, 315. | Zimmerman, W. I., 153, 561. |
| Zakariasen, B. M., 521. | Zelson, C., 137. | Zondek, B., 750. |
| Zander, D., 96. | Zhebrak, A. R., 327. | Zscheile, F. P., Jr., 324, 505. |
| Zaunmeyer, W. J., 762, 773. | Zichis, J., 403. | Zuber, M. S., 45, 185. |
| Zechmeister, L., 602. | Ziegler, P. T., 803. | Zwerman, P. J., 164. |

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.," "Conn.[New Haven]," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R." to those of the experiment stations in Hawaii and Puerto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

Abaca—

cytomorphological developmental study, 174.

mosaic, insect vectors and transmission of virus to corn, 789.

Abella, testing and propagation, Fla. 619.

Abortion—*see also* Bang's disease and *Bruce's abortus*.

in ewes, Wyo. 105.

in ewes, recent outbreaks, 109.

salmonellosis in horses, 529.

Abutilon theophrasti, viability of a seed after 20.5 years, 315.

Acanthophilus helianthi, new pest of safflower in India, 89.

Acarina sp. in crows, 82.

Acremyia dentata parasite of differential grasshopper, hyperparasite of, 798.

Acetic acid production and uses, 295.

Acetone butanol organism, growth factor and other nutritional requirements, 326.

Acetonemia and diabetes, Ky. 815.

Acetonemia in dairy cattle, Calif. 104.

Acetylmethylcarbinol, microbiological formation of, 394.

Achromobacter putrefaciens, notes, 396.

Achromotrichia—

in rats, treatment with synthetic pantothenic acid, 134.

in silver foxes, 276.

Acid(s)—

amino, *see* Amino acids.

fatty, *see* Fatty acids.

traumatic, synthesis of analogs of, 599.

Acorns, chemical composition, 725.

Acrididae—

distribution in central Oklahoma, 87.

new Iowa records, 641.

Acriflavine for treatment of chronic mastitis, 251.

Acrobasis caryae, *see* Pecan nut casebearer.

Acrodynia in rat, role of unsaturated fatty acids in, 703.

Acrosternum hilare, *see* Stinkbug, green.

Actinomyces—

antibioticus n.sp., new antagonist against micro-organisms, 32.

in potatoes, 775.

Actinomyces—Continued.

scabies, staining, 362.

sp., bacteriostatic and bactericidal substances produced by, 592.

Actuaria anthus in crows, 82.

Addison's disease, role of vitamin C in, 424.

Adelopus gaumanni on Douglas fir, U.S.D.A. 64.

Adelphocoris—

lineolatus in Arkansas, 306.

rapidus, *see* Plant bug, rapid.

Adrenal—

androgen and liver of rat, 749.

cortex and phosphorylation of vitamin B₁, 132.

necrosis, hemorrhagic, in rats, effect of pantothenic acid, 276, 277.

necrosis, prevention and cure by pantothenic acid, 422.

Adrenalectomy—

effect on pregnancy and survival of untreated and sesame oil treated rats, 336.

in pregnant albino rat, effect, 335.

Adsorption isotherm, relation to spreading force, 437.

Aedes sollicitans eggs, hatching response, 508.

Aedes varipalpus, research, 647.

Aerobacter—

aerogenes added to soil, effect, 18.

aerogenes, notes, 662.

and *Escherichia*, differentiation, value of citrate in, 82.

indologenes, utilization of glucose by, effect of phosphoglyceric acid and hexosediphosphate, 174.

spp. from olives, 370.

Aerobiology, different phases, technic for study, 66.

Aerological observations obtained by kites, airplanes, and sounding balloons, U.S.D.A. 13.

Aerological soundings, winter, at Fairbanks, Alaska, data from, U.S.D.A. 13.

Agar, hardness, method for determining, 32.

Agricultural—

Adjustment Administration program benefits, how shared by landlord and tenant, Iowa 262.

Agricultural—Continued.

- and food control in Switzerland, U.S.D.A. 679.
- and food control, wartime organization for, U.S.D.A. 679.
- and grazing ecology in Utah, historic records, 265.
- commodities, exports and domestic demand, effect of trade agreements, Iowa 263.
- credit for Oklahoma farmers, sources and use, Okla. 830.
- economics and student with urban background, 676.
- economy, Egyptian, wartime aspects, U.S.D.A. 679.
- engineering, *see* Engineering.
- experiment stations, *see* Experiment station(s).
- extension, *see* Extension.
- island in Cotton Belt, in Cullman Co., Alabama, U.S.D.A. 843.
- machinery—*see also* Combine.
 - and field power, Idaho 828.
 - for corn growing, U.S.D.A. 115.
 - operation, care, and repair, 408.
- periodicals of United States and Canada, 1810 to 1910, U.S.D.A. 286.
- planning, economic and social aspects, Mont. 830.
- population and labor, Calif. 117.
- population of Arizona, composition, Ariz. 120.
- products—
 - cost of production, Mich. 687.
 - home-grown, used by farm household, Mich. 265.
 - marketing, Calif. 117.
 - of California, exports, Calif. 117.
 - power alcohol from, possibilities, Iowa 151.
- research, additional bibliographic aids in, editorial, 577.
- research, nutrient element slighted in, 22.
- science, Rothamsted memoirs on, 430.
- situation and tables of prices, Okla. 677.
- statistics, international yearbook, 119.
- tenancy, *see* Farm tenancy and Land tenure.
- trade, wartime policies and controls, U.S.D.A. 679.

Agriculture—

- Alabama, characteristics and farming areas, Ala. 678.
- changing, and the war, 548.
- contributions of leading Americans to, 121.
- Department of, *see* United States Department of Agriculture.
- economics of, 676.
- electricity in, *see* Electricity.
- in Appalachian region, future of, W.Va. 689.
- in British Malaya, U.S.D.A. 679.
- in Southwest, textbook, 555.
- in Yakima Valley, economic conditions and problems, Wash. 548.

Agriculture—Continued.

- increase in custom work and changes in cultural practices, Ariz. 676.
- modern, textbook, 267.
- of Oklahoma, changes in, Okla. 830.
- relation to industry, 518.
- role in hemisphere defense, U.S.D.A. 679.
- trends in, Ky. 829.
- Agromyza simplex*, *see* Asparagus miner.
- agronomic studies, planning experimental fields for, Iowa 160.
- Agrothercutes pygoleucus*, biology and immature stages, U.S.D.A. 230.
- Air in small cabinets, control of temperature and humidity, 85.
- Alabama argillacea*, *see* Cotton leaf worm.
- Alabama College, notes, 718.
- Alabama Station, notes, 718.
- Alabama Station, report, 575.
- Albumin, egg—
 - composition, relation to quality, Wash. 518.
 - dried, quality, Iowa 231.
 - secretion, physiology of, 467.
- Albuminuria in dairy cows at parturition, therapy for, 527.
- Alcaligenes radiobacter*—
 - strains, metabolism and functional relations, Fla. 589.
 - use of carbohydrates and sugar acids by, 316.
- Alcohol—
 - and byproducts, yields, improvement, Idaho 724.
 - byproduct, feeding value for poultry, Md. 281.
 - effect on adequacy of B vitamins in American diet, 422.
 - power, from farm products, possibilities, Iowa 151.
 - sources and markets for, Idaho 724.
- Alder, black, as pioneer tree on sand dunes and eroded land, 485.
- Alfalfa—
 - alone, nutritive value, 391.
 - and grass meadows, effects of cultivating and manuring, Wyo. 43.
 - B deficiency of, borax for remedy, Idaho 751.
 - bacterial wilt, Mich. 65.
 - boron deficiency in, West. Wash. 488.
 - breeding, Ariz. 608, Kans. 40, R.I. 753, Wash. 471.
 - breeding for insect resistance, 789.
 - carotene in, preservation methods, Idaho 724.
 - culture experiments, Wash. 471, Wyo. 43.
 - differentials in leafhopper injury and recovery after cutting, 839.
 - disease resistance, breeding for, Kans. 41.
 - diseases, Kans. 65, Wash. 487.
 - failures, etiology and control, Wash. 487.
 - fertilizer tests, Ariz. 608, Idaho 751, La. 752, N.Mex. 183, 753, Wash. 471, Wyo. 43.
 - grinding for lambs, Wyo. 98.

Alfalfa—Continued.

- hay, feeding alone and with concentrates to cows, Oreg. 240.
- hay for steers, first, second, and third cuttings, comparison, Nev. 516.
- in mixtures with grasses, tests, Wyo. 43.
- in Nebraska, Nebr. 614.
- inoculation, fertilizer, and B tests, West. Wash. 471.
- insects, studies, Kans. 84.
- leaf meal, efficiency for hatchability of eggs, effect of mash levels, R.I. 805.
- leaf meal, optimum level for feeding to hogs, Fla. 651.
- leaf meal, productive energy in fowls, Tex. 388.
- Lygus* insects attacking, possible control, Idaho 786.
- manure and fertilizer tests, Wash. 593.
- meal, machine-dried, under variable conditions of storage, loss of carotene in, 801.
- measurement of winter growth for grazing value, Ariz. 608.
- mosaic virus, concentration in tobacco plants at different times, 213.
- mosaic virus, physical properties, 71.
- mosaic virus protein, purification and properties, 212.
- nectar and bees, 228.
- on bacterial wilt-infected soil, variety tests, Iowa 182.
- orchard grass mixtures for hay, West. Wash. 471.
- pasture, irrigated, for lamb and pork production, Wyo. 98.
- pasturing with lambs and pigs, Wyo. 93.
- plant bug in Arkansas, 506.
- plants receiving potassium chloride, deficiency symptoms on, Mass. 752.
- resistance to fungus parasites, 771.
- response to cultivation, manure, and T. V. A. phosphate, Wyo. 43.
- seed crop failures, relation to *Lygus* bug damage, Utah 615.
- seed production, role of *Lygus* spp. in, 221.
- seed submitted for registration, germination and hard seed in, 330.
- seedlings, storing, 339.
- silage, *see* Silage.
- Stemphylium* leaf spot, 209.
- timothy mixtures, seeding, use of grass seeding attachments on corrugated land rollers, Wis. 471.
- value for silage, R.I. 810.
- varieties, appraisal, cutting treatments as aid in, 339.
- varieties, forage yields, 339.
- variety tests, Ariz. 608, Idaho 751, Kans. 40, Ky. 751, Md. 182, Me. 609, N.Mex. 183, Nebr. 614, Tenn. 470, Wash. 471, West. Wash. 471, Wyo. 43.
- weevil, new, studies, Ariz. 641.
- wilt-resistant lines, Wis. 471.
- yellow-flowered, rust on, Ariz. 629.
- yellows, control, Idaho 729.

Alfalfa—Continued.

- yields in mixture v. alone, Wyo. 43.
- Algae, fresh water, effect of moonlight on photosynthesis, 324.
- Alkali—
 - problems, research, regional salinity laboratory cooperating with experiment stations in, Utah 717.
 - salts in Big Horn River, Wyo. 115.
 - soils, colloidal constituents, 161.
 - weed as sheep pasture, Idaho 751.
- Alluvial deposits of Ohio River, 162.
- Allyl isothiocyanate and related oils, bactericidal properties, 157.
- Almond(s)—
 - crown gall cure, Calif. 65.
 - fruit, growth study, 57.
 - moth in warehouses and factories in Great Britain, 643.
 - storage, U.S.D.A. 411.
- Aloes, Barbados, curative properties for burns, 595.
- Alternaria*—
 - citri*, cause of new storage rot, Ariz. 620.
 - aurantii* blight of carnation, Mass. 769.
 - macrospora*, cause of cotton stem blight, 633.
 - pathogenicity and taxonomy of species, Fla. 629.
 - solanii* pathogenicity to potato tubers, 210.
 - tonalis*, cause of sugar beet root rot, 211.
- Aluminum in biological material, 698.
- Alyceclover—
 - as hay crop, adaptation trial, S.C. 42.
 - not superior to lespedeza, Miss. 336.
 - production trial, La. 752.
- Amaryllis bulbs, effect of hot water and cyanide, 785.
- Amazon fly, parasite of sugarcane borer, 648.
- Ambrosia beetle, experiments with, 792.
- Ambush bug studies, summary, 790.
- Ancha pallorana*, notes, 502.
- American Dairy Science Association—
 - meeting, 432.
 - papers, 518.
 - quality committees, objectives of, 524.
 - quality program, 394.
- d*-Amino acid oxidase in liver and kidney, importance of riboflavin for maintenance, 275.
- Amino acids—
 - as yeast nutrients, importance, 322.
 - for chicks, 389.
 - specific dynamic effects, 383.
- Ammonia—
 - conservation in manure, Me. 593.
 - toxicity to forms of plant and animal life, 456.
- Ammonification of fertilizer materials, Conn. [New Haven] 759.
- Ammonium—
 - sorption by Hawaiian clay soils, 739.
 - thiocyanate, herbicidal behavior, Calif. 618.
- Amphicoma vulpina*, notes, 643, Mass. 786.

- Amphidiploids**, mass production in cotton, 327.
- Amsinckia intermedia*, poisonous constituents of, Wash. 527.
- Amyloidosis** in milk, 672.
- Anabasine**, review of information, U.S.D.A. 502.
- Anabrus simplex*, see Cricket, Mormon.
- Anacetrinus deplautus*, notes, Kans. 84.
- Anaerobes**, activities in nature and disease, bibliography, supplement, 174.
- Analysis methods**, comparison of results, 670.
- Analysis of variance**, method of handling ratios by, 469.
- Ananas comosus*, chloride toxicity in, effect of potassium, 64.
- Anaplasmosis**—
and diseases of feeder cattle, Kans. 101.
deer as carriers, Calif. 104.
hereditary transmission by ticks, 532.
in Ohio, 107.
mosquito transmission, 815.
- Anarsia lineatella*, see Peach twig borer.
- Anasa tristis*, see Squash bug.
- Anastrepha fraterculus*, see Fruitfly, West Indian.
- Anastrepha ludens*, see Fruitfly, Mexican.
- Ancestors and embryos**, 464.
- Ancylis fragariae*, see Strawberry leaf roller, American.
- Androgen(s)**—
absorption through skin of rats, concentration as factor, 603.
and oestrogens, antagonism between, 180.
and uterine weight in immature rat, 37.
assay, chick comb method, 37, 749.
effect on pituitary and mammary gland, 332.
in immature male rat, twenty-four hour response to, 37.
production in female rat, 749.
suppression of development of reproductive function in female rat with, 603.
- Anemia**—
amino acids and hemoglobin production in, 128.
due to blood loss, utilization of iron and rapidity of hemoglobin formation, 418
- equine infectious**—
chemotherapeutic studies, 670.
histopathological studies, 529.
history and distribution, 825.
from lysine deficiency in deaminized casein, 851.
- Aneurin**, see Vitamin B₁.
- Angoumois grain moth** eggs, oviposition by *Trichogramma* on, effect of conditions, 220.
- Anguillulina dipsaci*—
affecting *Scilla campanulata*, 216.
role in rhubarb crown rot disease, 363.
- Animal(s)**—see also Cattle, Livestock, Mammals, Sheep, etc.
characteristics, estimating heritability of, 327.
diploidization process in, 746.
- Animal(s)**—Continued.
diseases—see also specific diseases.
neoplastic and neoplasticlike, studies, Mass., 815.
domestic, growth and development, Mo. 801.
experimental, role of vitamin E in growth and reproduction, 385.
farm, feeding, principles and practice, 381.
farm, heredity in, 601.
farm, productivity, physiological approach to evaluation, 461.
fats, see Fat(s).
game and domestic, parasites, relation between, Wyo. 105.
husbandry department of Utah Station, new laboratories developed by, Utah 717.
husbandry expanded for increasing needs, Miss. 515.
in deciduous forest, stratification and migration, 500.
intermediary metabolism with aid of isotopes, 559.
nutrition, relation to soil deficiencies and toxic constituents, 801.
nutrition, relation to toxic constituents in soils, 663.
orientation of, treatise, 81.
parasites, see Parasite(s).
pathology and parasitology, abstracts of contributions in, 663.
predatory and injurious, control, information for guidance of fieldmen and cooperators in, 639.
receiving sex hormones, modifications of bones, 38.
slaughtered, pH value of rumen contents, 655.
small, autopsy examinations, Ill. 815.
tissues, nicotinic acid in, estimation, 858.
toxicity of industrial gases to, 456.
valuable nongame, environmental improvement, 490.
- Annatto** as tracer in cream and detection, Md. 230.
- Annona* species, insecticidal properties, 641.
- Anomala eryana*, notes, 643, Mass. 786.
- Anomyetus senarius* n.g. and n.sp., notes, 217.
- Anopheles*—see also Malaria and Mosquitoes.
spp., distinguishing, first instar characters for, 797.
spp., studies, Iowa 218.
- Ant**, white, see Termite(s).
- Anthelmintics**, evaluating efficacy, 106.
- Anthocoridae**, new genus and species, 790.
- Anthrenomus**
grandis, see Bollweevil.
signatus, see Strawberry weevil.
- Anthophora* new species, from California, 514.
- Anthrax**, experimental transmission to horse and carabao, 537.
- Anticarsia gemmatilis*, see Velvetbean caterpillar.
- Anti-gray hair factor** in vitamin B complex, 704.

- Antihemorrhagic compounds—*see also* Vitamin K.
 as growth factors for John's bacillus, 252.
 comparative activities, 252, 574.
 preparation, 443.
 water-soluble, bio assay, 297.
- Antimony oxides, effect on soil and plant growth, Mass. 720.
- Antineuritic vitamin, *see* Vitamin B₁.
- Antirachitic, *see* Rickets and Vitamin D.
- Antiscorbutic, *see* Vitamin C.
- Anuraphis roseus*, *see* Apple aphid, rosy.
- Apanteles phyllura*, control, Ala. 490.
- Aphelenchoides megadorus*, new species of Tylenchoidea, 265.
- Aphid(s)—
 and transmission of potato virus diseases, Me. 222.
 biology and control, Fla. 641.
 black-margined or pecan, studies, Ariz. 641.
 control with zinc-safened calcium arsenate, Minn. 502.
 embryonic studies, 641.
 injury to vetches, varietal differences, Ala. 490.
 insecticides, charged dusts best for, Wis. 503.
 migration, analysis of trapping in North Wales, 377.
 possible vectors of raspberry mosaic, 219.
 western, annotated list, 645.
- Aphis*—
gossypii, *see* Cotton aphid.
 lion larva, snail-collecting, studies, 224.
maidis, *see* Corn leaf aphid.
paucicarpae, studies, Kans. 84.
pomi, *see* Apple aphid.
rumicis, *see* Bean aphid.
tetradytmia n.sp., description, 645.
- Apiculture, *see* Beekeeping.
- Aplanobacter stewartii*, *see* *Phytomonas stewartii*.
- Apparatus—
 adiabatic fermentation, construction and use, 600.
 for determining density and size in fungus colonies, 200.
 for measuring body of cream cheese, 246.
 for measuring resistance of types of concrete silo staves, Minn. 676.
 for recovery of fluids from plant tissues, 451.
 hair hygrometer with magnetic switch for humidity control in incubator room, U.S.D.A. 501.
 infiltration, 164.
 macrorespirometer, of constant pressure type, 296.
 micropipette, for determining ultramechanical analysis of soils, 731.
- Apple(s)—
 aphid, control, Calif. 83.
 aphid, rosy, control, 86.
 bark, amount of oil deposited in dormant spraying, 503.
- Apple(s)—Continued.
 better stocks for, 352.
 biennial bearing, correction by thinning, 351.
 biennial bearing, nature and control, N.Mex. 191.
 bitter pit, studies, [N.Y.]Cornell, 778.
 bitter rot control, 305.
 black pox, first record in Massachusetts, U.S.D.A. 357.
 blight studies, Iowa 205.
 bloom period and yield, Ohio 194.
 breeding, Iowa 190, Me. 620, Wyo. 48.
 bud mutations in, Mass. 762.
 buds, rest period, and glutathione, 350.
 canned dessert, 300.
 consumer's preferences for, Del. 117.
 crab, *see* Crab apple.
 curculio, larger, control, 640.
 Delicious, storage in artificial atmospheres, 55.
 Delicious, X-ray detection of mouldy core in, 75.
 dieback and internal cork, Calif. 65.
 diseases, estimated reduction in yield from, U.S.D.A. 760.
 diseases, notes, 365.
 diseases, spray programs for, R.I. 770.
 drop, retarding with hormone sprays, Wash. 477.
 dwarfing stocks for, Iowa 190.
 eastern-grown, relation of firmness to ripeness, U.S.D.A. 54.
 effect of modified storage atmosphere Iowa 190.
 false sting, virus disease, 75.
 fertilizer experiment, long period, 351.
 fertilizers, Me. 620.
 fire blight infection of blossoms, relation to nectar concentration, 779.
 fire blight transmission by bees and relation to nectar concentration, 779.
 flesh, histological structure, relation to growth and senescence, 352.
 foliage, frost injury in fall, 482.
 from Potomac River Valley, comparative storage temperatures, U.S.D.A. 621.
 fruit set, low-temperature hazard, Ill. 54.
 fruit size and color, factors affecting, Mo. 764.
 fungicides, development, 365.
 Golden Delicious, fruit thinning, Me. 620.
 grade and condition of commercial packs in midwinter, Mich. 685.
 grain aphid, studies, Iowa 218.
 Granny Smith, storage tests, 478.
 growers, packaging problems, Pa. 837.
 growing, efficiency of spray protection on surface, Wash. 503.
 growth and production, effect of claypan, 351.
 growth in sand culture, effect of N and P, Ky. 53.
 harvest spray residue on, 788.

Apple(s)—Continued.

- harvested, exposing to sunlight to improve color, effect, Del. 47.
- immunity to fungus diseases, relation to origin, 75.
- insects and insecticides, Iowa 218.
- insects of Iowa, 640.
- internal cork, relation to weather, N.H. 305.
- Jonathan, growth and yield, effect of diploid and triploid seedling stock, 602.
- juice, canning in Pacific Northwest, 300.
- juice clarification, effects, Wash. 444.
- juice, quality, Md. 154.
- leaf(ves)—
 - curling midge, biology and control, Mass. 787.
 - effect of water supply on rate of photosynthesis, transpiration, and respiration, 53.
 - photosynthesis and transpiration rates, effect of leafhopper injury, 778.
- leafhopper(s)—
 - injury, effect on photosynthesis and transpiration rates of leaves, 778.
 - studies, Iowa 218.
 - white, feeding habits, 377.
- maggot—
 - attraction to protein baits, 217.
 - control, Mass. 787.
 - control and new residue tolerances, 375.
 - insecticides for, Iowa 218.
 - mortality in fruit held in cold storage, U.S.D.A. 511.
 - relation to Hudson Valley apple market, 375.
 - studies, Me. 642.
- Malling rootstocks, compatibility of Bechtel's crab on, 763.
- maturity, shipping, and storage quality, Md. 190.
- maturity studies, Wash. 477.
- McIntosh, premature dropping, control, Mass. 762.
- orchard(s)—
 - boron problems, 214, 496.
 - hand-pollinating, methods, Wash. 477.
 - soil management, Iowa 190, Kans. 47.
 - soil moisture relations, Wash. 477.
- preharvest dropping, control, R.I. 762.
- premature dropping, sprays for prevention, Ky. 761.
- products, use in producing soft-curd milk, 520.
- pruning experiments, 482.
- rate of photosynthesis, relation to leaf structure, Kans. 48.
- rate of ripening, effect of carbon dioxide treatment, 55.
- red strains, fruit characteristics, Ohio 704.
- rootstocks, Del. 47.

Apple(s)—Continued.

- rootstocks, clonal, from free and crab seedlings, tests, 350.
 - rootstocks, propagation, Md. 191.
 - rot, etiology and control, Wash. 487.
 - rust control, Mich. 65.
 - safer spray schedules for, 386.
 - sauce preparation from Pacific Northwest varieties, 10.
 - scab and fruit spraying, Md. 205.
 - scab control, 360, Mass. 769.
 - scab control, new methods, 778.
 - scab control with sulfur, 635.
 - scab, development, U.S.D.A. 357.
 - scab, fungicidal control, 75, Me. 629.
 - scab fungus in Pennsylvania, maturity, U.S.D.A. 204.
 - scab fungus, maturation of ascospores, 366.
 - scab, nuclear phenomena in, 75.
 - scab, sprays for, 366, 496, 635.
 - scab studies, 365, Iowa 205.
 - scion variety grafted on Malling rootstocks, carbohydrate relations, 350.
 - spot diseases, Wash. 487.
 - spray programs to keep residues low, Wis. 503.
 - spraying, Kans. 48.
 - stippen, Ariz. 628.
 - stock and scion relations in, Iowa 190.
 - stocks, hardy, propagation methods, Wash. 477.
 - storage in modified atmospheres, Mass. 762.
 - storage research, Mass. 828.
 - stored, development of scald on, R.I. 762.
 - trees—
 - fertilization, Wyo. 48.
 - growth, effect of sprays, R.I. 762.
 - magnesium deficiency, 350.
 - planting, use of peat in, Mass. 762.
 - response to potash, 621.
 - seedling-rooted v. own rooted, Del. 47.
 - winter injury, stock-scion relations as factors, Me. 620.
 - young, cultural practices for, R.I. 762.
 - varieties, effect of clonal rootstocks, Mass. 762.
 - varieties, effect of stocks on seven years' growth, 54.
 - varieties, old v. new, Iowa 190.
 - varieties, studies, Wis. 478.
 - varieties topworked on hardy stocks, yields, 621.
 - variety tests, La. 762, N.Mex. 191.
 - vitamin C in, factors affecting, Va. 708.
 - Winesap, pruning, Kans. 47.
 - yields, adjusting for differences in tree size, 351.
 - zinc for, 215.
- Applesauce—
- effect on induced diarrhea in rats, 850.
 - preparation from Pacific Northwest fruit, 300.

Apricot(s)—

- and plum hybrids, cytological studies, 34.

ascorbic acid in, 424.

boron in, Ky. 852.

breeding, Calif. 52, N.Dak. 52.

huds, effects of Zn deficiency, 307.

effect of boron in irrigation water.

U.S.D.A. 367.

scales, olive and brown, control, Calif. 83.

Sclerotinia spp. affecting, 779.

Aptesis (*Peroporus*) *isugae*, parasite of hemlock sawfly, 230.

Arachnids, injurious, of Washington, bibliographical catalog, 218.

Aralac, descriptions and photomicrographs, 141.

Arborvitae, oriental, *Ooryneum* blight, cause and control, Oreg. 216.

Arctic soil and water, temperature of, 729.

Arginine—

dissociation, effects of salts on, 439.

requirement of chicks, 889, 804.

Argyroplaca illepidia, notes, 86.

Argyrotaenia citrana, see Orange tortrix.

Arizona Station, report, 717.

Arkansas Station, notes, 286, 718.

Arkansas University, notes, 287, 718.

Armillaria mellea, biological study, 169.

Armyworm(s)—

beet, studies, Hawaii 218.

fall, on corn, notes, P.H. 85.

injury and treatments, R.I. 787.

of garden and truck crops, Me. 642.

southern, glycogen in, relation to glucose ingestion, 797.

southern, structure and development of alimentary canal, U.S.D.A. 226.

Arsenic—

fixation in soils and effect on liberation of fixed phosphorus, Mass. 729.

oxides, effect on soil and plant growth, Mass. 729.

toxicity in soils following removal of trees, Wash. 445.

trioxide, herbicidal behavior, Calif. 618.

Arsenicals, testing toxicity to American cockroaches, 87.

Arsenious oxides, effect on soil and plant growth, Mass. 729.

Artesian pressure in observation wells in United States, 542.

Arthritis in swine, 111, Wash. 528.

Artichoke(s)—

levulose from, Iowa 151.

plume moth, control, Calif. 83.

Ascaridia—

bonasae in ruffed grouse, 405.

lineata in grouse, 406.

Ascaris, giant toad as vector of in Puerto Rico, 82.

Ascia protodice, see Cabbageworm.

Ascia rapae, see Cabbageworm, imported.

Ascomycete on orange in Brazil, 369.

Ascorbic acid—see also Vitamin C.

blood plasma, in dairy cattle, effect of feeding chloretone, 519.

blood plasma, of guinea pigs with scurvy, 278.

blood plasma, of men and women students, Wash. 556.

combined, excretion in pulmonary tuberculosis, 425.

concentration, determination, 9.

crystalline, from Cebione, orange juice, and sprouted oats, comparison, Kans. 126.

effect on excretion of homogentisic acid and other tyrosine metabolites, 572.

in citrus fruit juices, determination, 442.

in citrus fruits from Rio Grande Valley, variation in, 709.

in drawn samples of blood, preservation, 9.

in evaporated milk, powdered milk and products, 277.

in Florida orange juice, 134.

in foods, effect of sodium chloride and vinegar on oxidation, Me. 691.

in fruits and vegetables, 424.

in milk, relation to mastitis, 101.

in packaged food purchased in retail markets, 134.

in pigmented fruits and vegetables, 134.

in plasma of newborn infant, variation in concentration, 135.

metabolism of college men, Idaho 855.

of flower nectar of Labiatae, 424.

of goat blood, milk, and tissues, 234.

oxidase, studies, 9.

plasma, effect of arsenicals, bismuth, and iron, 425.

retention as criterion of nutritive value in vegetables, 134.

role in reproduction in cattle, 178.

synthesis by cowpea, relation to light, 170.

urinary excretion by rat, effect of carbohydrates, 277.

utilization and excretion by dairy cow, 656.

Ash leaf rust, epidemic of, R.I. 770.

Ashes, wood, see Wood ashes.

Asparagus—

ascorbic acid in, 424, 706.

beetle control, Utah 642.

beetle, studies, S.C. 84, Wash. 503.

carotene in, 564.

culture, Iowa 190, Tenn. 477.

fertilizer experiment, effect of manure on availability and penetration of phosphorus, 345.

green and white, comparison, 345.

miner, studies, Wash. 508.

planting depth, Tenn. 477.

planting depth, effect, 345.

rust, Wash. 488.

seedlings, factors promoting first-year bloom as key to sex, West Wash. 478.

varietal improvement and culture, Mass. 762.

- Asparagus**—Continued.
varieties and culture, Calif. 49.
- Aspartic acid**, dissociation, effects of salts on, 439.
- Aspen lands in Lake States**, restoring conifers to, U.S.D.A. 202.
- Aspergillus**—
fumigatus in wild herring gulls, 406.
niger, action of acetic acid on, 156.
- Aspidiotus perniciosus**, see San José scale.
- Aspidistra** leaves, chlorophyll-protein compound, 597.
- Asporial** for wheat stem rust control, 488.
- Association of**—
Land-Grant Colleges and Universities—
notes, 144, 720.
officers and standing committees, U.S.D.A. 690.
proceedings, 690.
Official Agricultural Chemists, methods of analysis, 5.
- Aster yellows**, California, control, Calif. 65.
- Anjesky's disease**, see Paralysis, infectious bulbar.
- Australorbis glabratus**, giant toud as distributing agent, 83.
- Automobile**, family expenditures for, U.S.D.A. 284.
- Autoserica castanea**, see Garden beetle, Asiatic.
- Auxin(s)**—
activity in plants, relation to four-carbon acids, 599.
and its precursor in coleoptiles, 319.
extraction from plant tissues, 26.
in plant material, estimation and identification, 741.
liberation from plant tissues, 170.
mechanism of cell elongation initiated by, 319.
production by bakers' yeast, 453.
relation to plant growth, 172.
- Avallameter**, use in soil moisture control, 732.
- Avena**, growth of first internode, light as factor, 170.
- Avena**, inhibition of first internode by light, 169.
- Avocado(s)**—
anthracnose, spraying experiments for control, 368.
dieback, cause, 308.
dieback or decline, Calif. 65.
diseases, control, Fla. 629.
diseases in Florida, U.S.D.A. 637.
excretion of sugars after eating, 605.
floral abnormality, 483.
Fuerte, fruiting behavior, Calif. 52.
importance of root aeration in, 483.
little-leaf and zinc deficiency, 368.
research, 483.
trunk cankers, 497.
varieties and culture, Fla. 619.
- Azalea(s)**—
flower spot in California, U.S.D.A. 628.
lacebug, insecticides for control, Ala. 499.
- Azalea(s)**—Continued.
mealybug, insecticides for control, Ala. 499.
propagation by stem and leaf-bud cuttings, 62.
varieties, propagation, etc., 624.
- Azotobacter**—
chroococcum—
dissociation in, 448.
nitrogen fixation by, effect of protozoa, 166.
use of carbohydrates and sugar acids by, 316.
geographic distribution, relation to environment, Nehr. 734.
growth and activity, effect of reaction of soil solution, Kans. 13.
- Babeock**, S. M., biographical sketch, 121.
- Babeock test** applied to milk and cream, accuracy, Kans. 98.
- Bacillus**—
abortus, see *Brucella abortus*.
botulinus, see *Clostridium botulinum*.
cereus, action of acetic acid on, 156.
mesentericus, action of acetic acid on, 156.
radicicola, see Legumes, inoculation, and Nodule bacteria.
viticorvus, notes, 368.
- Bacon pig**, composition, use of sample joints and carcass measurements as index, 387.
- Bacteremia**, staphylococci, treatment with sulfapyridine and sulfathiazole, 666.
- Bacteria**—
acid-fast, staining, 529.
added to soil, survival, and resultant modification of soil population, 18.
adhering to trichina larvae, removal, 399.
adsorption of H⁺, 601.
causing pathological growth, pathogenicity destroyed by specific amino acids, 64.
cell division, 32.
coliform, differential reactions, effect of temperature, Mass. 724.
effects of long ultraviolet and near visible radiation, 169.
fluorescent, in dairy products, 394.
gram-differentiation by simplest method, 529.
green-fluorescent, serological and cultural study, 33.
in milk and soil, see Milk and Soil.
multiplying, oxygen consumption, 33.
nitrogen and accessory growth factor requirements, Iowa 151.
physicochemical behavior, 32.
reaction of certain stains with, 320.
red and brown forms, absorption spectra of carotenoids in, 33.
specific enzyme systems in, technic for determination, 32.
staining with acid dyes, 326.
sulfur-oxidizing, new species from a coprolite, 19.

Bacteria—Continued.

- survival and death in desiccated state, 461.
- surviving pasteurization, studies, 525.
- thermoduric, in milk, 520.
- thermoduric, in pasteurized milk, 394.
- toxicity of industrial gases to, 456.

Bacterial—

- cell, structural differentiation within, 32, 174.
- cultures, closures for, evaluation of plastic screw caps as, 32.
- forms, pictures taken with electron microscope, 326.
- morphology shown by electron microscope, 326.
- spore antigens in taxonomy, significance, 505.
- spores, killing by shaking with abrasive materials, 32.

Bactericidal agents, selective, 174.

Bactericidins, normal, of poultry, 404.

Bacteriologists, Society of American, proceedings of local branches, 174.

Bacteriology—

- basic principles of study, 32.
- textbook, 529.

Bacteriophage(s)—

- elimination from starter cultures for cheese manufacture, 813.
- Rhizobium meliloti*, in soils, 19.
- staphylococcus, isolation and characteristics in bovine mastitis, 400.

Bacterium—

- coli, see *Escherichia coli*.
- radiobacter, characterization, 33.
- radiocolla, see Legume(s) inoculation and Nodule bacteria.
- rhaponticum* cause of rhubarb crown rot disease, 363.
- solanacearum*, bacteriophage from, 206.
- syringae* of cherry nursery stock, 214.

Bahia grass seed production, Ariz. 608.

Bailey, L. H., biographical sketch, 121.

Bakery products, use of dried egg whites in, 269.

Banana(s)—

- dietary uses in health and disease, 412.
- diseases, handbook, 497.
- in Chinese literature, 692.
- in daily diet, effect on nitrogen and mineral balances of children, 562.
- leaf spot, control, 497.
- leaf spot, description, 368.
- nutritive value, storing and composition relation to quality, 692.
- Panama disease or wilt, control, 497.
- stalk fiber as organic matter for soil improvement, Mass. 762.
- treatment of diarrhea in children, 692.

Bang's disease—see also *Brucella abortus*.

- and undulant fever, interrelation, Mich. 665.
- calf vaccination for, 399, 664, 667, Calif. 104, Md. 248.
- control by vaccination, 538.
- control in station herd, Me. 248.

Bang's disease—Continued.

- in mares, 528.
- studies, 230, Kans. 104, U.S.D.A. 253.
- vaccination, field experiments, 532.

Barbarea vulgaris black rot, 78.

Barberry—

- eradication for black stem rust control, Iowa 205.
- Japanese, new pest of, 793.

Barium sulfate in solutions of electrolytes and ethanol, electrokinetic potentials, 580.

Barley—

- boron in, Ky. 852.
- breeding, Iowa 182, Kans. 40, Md. 182, N.Mex. 183, Tenn. 470, Wash. 471.
- California, riboflavin in, sufficient for growing pig, 382.
- culture experiments, Kans. 40, Tenn. 470.
- diseases, estimated reduction in yield from, U.S.D.A. 760.
- fall v. spring plowing for, Wis. 472.
- fallow methods for, Kans. 753.
- fertilizer tests, Wis. 472, Wyo. 43.
- Ioglos, adaptation studies, Iowa 182.
- leaves, mature and senescent, protein synthesis in, 24.
- leaf rust, in North Dakota, N.Dak. 771.
- loose smut, varietal resistance, 69.
- loose smuts, identification technic, 69.
- manure and fertilizer tests, Wash. 593.
- oats, rye, and wheat, comparison of yields, Tenn. 470.
- pasture clippings, composition, seasonal variations in, Ariz. 655.
- roots, excised, metabolism of nonvolatile organic acids by, 322.
- tetraploid six-rowed obtained by colchicine treatment, 462.
- varieties and selections, Del. 40.
- varieties, yields, U.S.D.A. 44.
- variety tests, Ariz. 181, 608, Fla. 608, Ind. 751, Iowa 182, Kans. 40, Md. 182, Me. 609, Miss. 337, N.Mex. 183, 753, N.C. 42, Tenn. 470, Wash. 471, Wyo. 43.
- winter, hardiness tests, Colo. 751.
- yields, N.Dak. 42.
- yields, effect of storage of treated seed, Ill. 360.

Bartonella canis in Indian dogs, 538.*Basidiosporium gallarum* pathogenicity, Iowa 205.*Bassia hyssopifolia* as sheep pasture, Idaho 751.

Basswood, snow-damaged, top rot in, 79.

Batocera rufomaculata, bionomics and control, 645.

Beach apple poisoning, 529.

Bean(s)—see also Mung beans, Soybean(s), and Velvetbean.

- aphid, toxicity of nicotine compounds to, 221.
- bacterial blight, Fla. 629.
- beetle, Mexican, control, Ala. 499, Me. 642.
- Brazilian, indicators of tobacco mosaic virus, 218.

Bean(s)—Continued.

- breeding, Me. 620, Tenn. 477, Wyo. 48.
- breeding for disease resistance, Fla. 629.
- breeding for virus disease resistance, Idaho 769.
- calcium deficiency symptoms in, effect of form of available nitrogen, 772.
- crop, late fall, requirements for, Miss 470.
- cucumber mosaic virus pathogenic on, 360.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases in Idaho, Idaho 71.
- dried, boron in, Ky. 852.
- for canning, costs and returns, Mass. 830
- histological reactions, to *l*-tryptophane, 320.
- home-canned string, keeping quality and vitamin C in, Wyo. 122.
- improvement in Idaho, Idaho 71.
- insects destructive to, Hawaii 218.
- kidney, diseases, seed-borne, 491.
- kidney, growth, availability of ions on permutite and demineralite, B.I. 739
- leafhopper studies, Fla. 642.
- leaflets, diseased and healthy, rates of apparent photosynthesis and respiration, 491.
- leaves, starch hydrolysis in, effect of growth substances, 26.
- lima—
 - breeding, Md 191.
 - breeding, noteworthy results, Calif 40.
 - for canning and freezing purposes, Md 191.
 - freezing preservation, varietal suitability, U.S.D.A. 50.
 - germination and growth, effect of fertilizer composition and application, 346.
 - green, carotene in, 564.
 - production in central Washington variety and time of planting, 192
 - varieties, Wis. 478.
 - yield, effect of N and P, Ky. 761.
- mosaic resistance, Miss. 430.
- pinto, breeding, N.Mex. 183.
- pinto, production tests, N.Mex. 753.
- pinto, raw and cooked, iron in, N.Mex. 268.
- plants, histological response to tetrahydrofurfuryl butyrate, 23.
- pod borer, control, Hawaii 218.
- pole, variety tests, Miss. 345.
- powdery mildew, inheritance of resistance to, Calif. 492.
- rust in Hawaii, second strain, U.S.D.A. 628.
- rust, notes, Wash. 488.
- sections and detached segments of second internode, effect of indoleacetic acid, 28.
- snap—
 - drought tolerance in, 762.
 - effect of sodium nitrate, Me. 620.

Bean(s)—Continued.

- snap—continued.
 - fall-grown, irrigation, Tenn. 477.
 - freezing preservation, varietal suitability, U.S.D.A. 50.
 - germination and growth, effect of fertilizer composition and application, 346.
 - new mosaic-resistant varieties, 209.
 - planting rates, Me. 620.
 - tissues affected with black root, 768.
 - varieties and fertilizers, La. 761.
 - yield and grade, effect of frequency of harvest, Me. 620.
- straw, feeding value for fattening lambs, Wyo. 653.
- studies, Calif. 65.
- thresher, rubber-roller, Calif. 115.
- tissues affected with black root, histological study, 772.
- vitamin B₃ content, effect of cooking, 567.
- X-ray studies, 463.
- Beauveria bassiana*, method for obtaining spores, 376.
- Bedbug(s)—
 - Brazilian, chicken, biology, 87.
 - eggs, tests with liquid insecticides, 641.
 - testing insecticides against, 642.
- Beech production, properties, and uses, 259.
- Beechwood, white rot and brown rots on, 498.
- Beef—see also Cattle, beef.
 - cause of darkening in color, 382.
 - effect of ration on rate and cost of gains and quality, S.C. 92.
 - frozen-defrosted, drip and color in, relation to storage temperature, 382.
 - grade, effect of pasture, Ill. 653.
 - held in low-temperature storage for different intervals, keeping qualities, effect of soybeans, Iowa 281.
 - production, relation to number of cattle on farms, Okla. 677.
 - production, Sudan grass pasture and other feeds for, Tex. 385.
 - quality and palatability, Kans. 92.
 - storage and aging, Wash. 516.
- Beehive(s)—
 - overcast winter protection cases, 640.
 - role of pollen in economy of, U.S.D.A. 502.
- Beekeepers and soil conservation program, 380.
- Beekeeping—
 - equipment, suggestions for beginners, Miss. 502.
 - possibilities in favored areas of Mississippi, Miss. 430.
- Bee(s)—
 - and aflata nectar, 228.
 - breeding for disease resistance, Wyo. 91.
 - breeding stock, studies, Calif. 84.
 - colonies, developing, pollen traps and pollen supplements in, U.S.D.A. 502.
 - dipterous parasite, 88.
 - disease resistance program of Iowa, 640.
 - feeding substitutes for pollen, Kans. 84.
 - fly on wheat, Kans. 84.
 - foods, vitamin content, 228.

Bee(s)—Continued.

- foulbrood, *see* Foulbrood.
- husbandry, manual, N.J. 228.
- larvae, susceptibility to American foulbrood, 91.
- natural history, management, and diseases, 91.
- poisoning, review, 229.
- pollen needs for brood rearing, 640.
- population and floral competition in New Jersey orchards, 514.
- protection from spray poisoning, Calif. 84.
- queen and worker, food and development, Minn. 648.
- queen, in mating cages, factors affecting, U.S.D.A. 501.
- toxicity of insecticides to, 228.
- two-queen colonies, management, Kans. 84.
- young, behavior in confinement, 228.

Beet(s)—*see also* Sugar beet(s).
and cabbages, varietal differences to boron deficiencies, Wis. 498.

- byproduct rations for steers and lambs, phosphorus needed with, Idaho 800.
- byproducts for fattening livestock, Wyo. 93.
- chemical composition, effect of crown gall formation, 361.
- field or fodder, *see* Mangels.
- insects, studies, N.Mex. 219.
- internal break-down, control, [N.Y.] Cornell 638.
- leafhopper—

- chloroform-soluble components as indication of distance traveled, 221.
- egg parasites, apparatus and technic for study, U.S.D.A. 649.
- tomatoes grown free from, Idaho 786.

- photoperiodic induction, effect of environment, 323.
- sirup for production of spring lambs, Idaho 801.
- sugar, *see* Sugar beet(s).
- varieties, Wis. 478.

Bemisia gossypiperda, biology and control, 88
Benne blight, hot water seed treatment in, 768.

Bentgrass(es)—

- breeding, R.I. 753.
- Colonial, proliferation in, R.I. 753.
- diseases, control, R.I. 770.
- effect of seed treatment, R.I. 753.
- test of compost for, R.I. 753.
- varieties and strains, fertilizer tests, R.I. 753.
- varieties and strains, seed production, R.I. 753.

Berbamine, isolation from *Mahonia swaseyi*, 25, 439.Berberine, isolation from *Mahonia swaseyi*, 25, 439.

Beriberi, occidental, with cardiovascular manifestations, relation to thiamin deficiency, 567.

Bermuda grass—

- establishment from seed in nurseries, Ark. 612.
- sod, dandelion control with kerosene, Kans. 41.

Berries, *see* Fruits, small, and Raspberries, Strawberries, etc.*Biatorella resinæ*, perfect stage of *Zythia resinæ*, 171.

Bibliography of—

- bee poisoning, 229.
- blood of dog, nitrogenous constituents, 538.
- botanical problems in boreal America, 451.
- botanical works of Société Royale du Canada, 595.
- coyote in Yellowstone, 500.
- dog tick, American, 800.
- encephalomyelitis, equine, 254.
- encephalomyelitis, equine, virus, eastern, effect of age on susceptibility in mice, 824.

Erysipelothrix rhusiopathiæ, 105.

farm tenancy, Tenn. 410.

fleas infesting wild hares and rabbits, key, 648.

food habits in United States, 269.

fruitflies, 89.

grape white rot, 497.

helminth parasites of sheep, 670.

helminths in dogs and cats transmissible to man, 113.

Hoplomitilla, Minn. 648

insects and myriapods, embryology of, 83.

insects of Brazil, 85.

lead arsenate injury to people exposed to it, 643.

lungworms in deer, tissue changes in, 402.

mammals of Illinois, 500.

metals, trace, in biological material, 694.

milk flavors, 395

nicotinic acid, 702.

pantothenic acid, 704

parasites of cattle, 822.

plant diseases, main types, 628.

plant resistance to insects, 789.

plant taxonomy, ecology, and geography, 451.

Plecoptera of world, [N.Y.] Cornell 220.

poultry diseases, 113.

P'tinidae of economic importance, 340.

research studies in education, 55.

riboflavin, 703.

Salmonella group differentiation, 819.

tapeworms in poultry, tin for treatment, 114.

teeth, mottled enamel, caries, and fluorine, 419.

vitamin B₁ activity, 701.vitamin B₁, revision, 700.vitamin B₂, 703.

vitamin B, 573, 712.

vitamin K, 713.

yellow fever, 647.

- Bigonicheta setipennis*, successful hibernation, in Ontario, 786.
- Bile**—
acids, curative effect on gizzard erosion in chicks, 255.
preparation, gastric emptying time after ingestion, 271.
salts for evagination of tapeworm cysts, 500.
salts, substitute for, with substances possessing vitamin K activity, 715.
- Billbug**, clay-colored, studies, Iowa 218.
- Birdweed**—
control, Ariz. 608, Fla. 609, Idaho 751, Iowa 132, N.Mex. 183, 753.
killing with chlorate, Kans. 41.
physiological study, Kans. 41.
- Biological**—
products, manufacture, standardization, and use, 819.
substances, effect of X-ray irradiation, Iowa 205.
- Biotin**—
and growth of *Fusarium avenaceum*, 710
formation in rumen of cow, 802.
like substance produced by *Diplodia zeae*, 740.
synthesis by micro-organisms, 32.
- Birch**—
leaf-mining sawfly, parasites of, U.S.D.A. 229.
paper, red heart in, 79.
yellow, cankers and decay of, 638.
- Bird(s)**—
attracting. Audubon guide to, 640.
Conservation Act, Migratory. acquisition of land under, 639.
control, Federal policies, 499.
effect on grasshopper outbreaks in California, 499.
embryos of different species, incompatibility in limb grafts made between, 605.
enemies of sugar beet wireworm, 513.
heart rate, variations in, 640.
incubation period, factors affecting, 641.
internal parasites, N.J. 254.
length of incubation in, factors controlling, 500.
melanophore differentiation in, effect of hormones, 603.
migratory, regulations relating to, 639.
naturalized in North America, 499.
of Kansas, check list, 499.
of paradise, twelve-wired, new species of cestode from, Minn. 640.
of Walker Co., Texas, ecological classification, 499.
wild, egg temperatures, 500.
- Black beetles**, *Hylastes*, in North America. taxonomic revision, U.S.D.A. 228.
- Black Hills beetle**, new blue stain fungus associated with, 782.
- Black stem rust** control by barberry eradication, Iowa 205.
- Black vine weevil**, studies, Wash. 503.
- Blackberry(ies)**—
canker and dieback, Idaho 769.
inheritance in, R.I. 762.
testing and breeding, West.Wash. 478.
varieties, La. 761.
variety tests, Ky. 761.
Blackhead in turkeys, 255, Ky. 815, Md. 248.
Blackhead in turkeys, types of liver lesions in, 541.
Blatella vaga, notes, 217.
Blindness in cattle and goats, hegarl fodder as preventive, N.Mex. 239.
Bleesus leucopterus, see Chinch bug.
- Blood**—
and urine, riboflavin in, 275.
ascorbic acid in, preservation, 9.
cell, red, counts, effects of sex and gonadotropic hormones, 330.
cell, red, radioactive iron as hemoglobin in, 561.
cell volume determination, capillary hematocrit method, 439.
chemistry of fox, 539.
cocarboxylase values, determination, revaluation of method, 563.
concentration of acetone bodies in, effect of glucose feeding, 519.
constituents of cattle, effect of vitamin A supplementation, 520.
extraction of lactogenic substance from, 603.
horse, variations in calcium, inorganic phosphorus, and serum proteins, 537.
lactic acid determination in, 726.
nicotinic acid in, estimation, 858.
of dairy cattle, acetone bodies in, variations, 519.
of dog, nitrogenous constituents, 538.
of jugular vein, detection of siderocytes in, value, 529.
picture of normal and hypophysectomized rat, effect of sex and pituitary hormones, 603.
plasma of dairy cows, carotene in, 519.
protein determinations, routine, value, 414.
regeneration, see Hemoglobin.
review of literature, 694.
serum, human, vitamin D in, 572.
sugar studies on golfers, 126.
volume in cobalt polycythemia, 272.
- Blowfly(ies)**—
cage for culture of surgical maggots, 787.
myiasis, relation to moisture balance of living fleece, 379.
pH of alimentary canal, 89.
physiology and toxicology, 89.
rearing in laboratory, 502.
sheep, larvicides and repellents for, 644.
- Blue grama**, culture experiments, Kans. 40
- Blueberry(ies)**—
and related species, seed size in, 622.
breeding, Me. 620.
Cabot, growth, effect of nutrients and growth substances, 622.
chemical analyses, Me. 620.
cranberry fruitworm on, control, 510.

Blueberry (les)—Continued.

- cuttings, hardwood, propagation, R I 762
- dieback and defoliation, Mass. 770.
- fertilizer tests, West.Wash. 478
- fields, burning, Me. 620.
- high bush, nutrition and culture, Mass. 762.
- low-bush, selection in West Virginia, 622.
- maggot, attraction to protein baits, 217.
- maggot, studies, Me. 642.
- mulching and nutrient requirements, Md. 191.
- nutrition, 196.
- plantings, injury from salt spray and salt in soil, 64.
- pruning tests, West.Wash. 478.
- thrips, studies, Me. 642.
- varieties, La. 761.
- varieties, new, description U.S.D.A 56
- variety tests, West.Wash. 478.

Bluegrass—

- evaluation for sound pasture program, Wis. 522.

Kentucky—

- and Canada, artificial hybrid between, 463.
- and other grasses in mixtures, effect of Korean lespedeza, Ky. 751.
- effect of seed treatment, R I. 753.
- germination, seed setting, and N fertilizer tests, Ky 751.
- palatable strains, Wis. 471.
- pasture, carrying capacity, relation to grazing management, Iowa 182.
- pasture, continuous v. alternate grazing, Ky. 801, 810.
- pastures, yields and grazing days from, Wis. 522.
- soil, dandelion control with kerosene, Kans. 41.
- soil, N fertilizer test, Tenn. 471.
- variety tests, Iowa 182.

Bluestem pastures, effect of fertilizers and burning on, Kans. 41.**Bobwhite, see Quail.****Body fat, character of, relation to food, rats for study, Iowa 231.****Body weight and organ weight, relation in growing and mature animals, Mo. 801.****Bogs, post pleistocene, of Puget lowland of Washington, pollen studies, 24.*****Boletus elegans*, nutrition, role of larch root in, 601.****Bollweevil—**

- dusting for control, U.S.D.A. 502.
- insecticides against, 504.
- on cotton, S.C. 84.
- simplified instructions for control, Tex. 504.

Bollworm—

- pink, destruction by hot air treating machines in gineries, 88.
- simplified instructions for control, Tex. 504.

Bombyx mori*, see Silkworm.*Bone(s)—**

- avian, changes in, due to injected oestrogen and during reproductive cycle, 604.
- development in rat on low manganese diet, 418.
- of animals receiving sex hormones, modifications of, 88.
- phosphatase studies in chick perosis, 673.
- strength of healed rachitic and normal rats, 280.

Books on—

- agriculture, economics of, 676.
- agriculture in Southwest, 555.
- agriculture, modern, 267.
- animals, orientation of, 81.
- bacteriology, 529.
- banana, 412.
- banana diseases, 497.
- biological products, manufacture and use, 819.
- dairy profit, 242.
- dietetics, 559.
- farm machinery, 408.
- food habits in United States, 260.
- foods, 121.
- foods, introductory, 207.
- fungi, edible and poisonous, 345.
- geography, economic, principles of, 844.
- household equipment, 285.
- insect pests, 375, 501.
- livestock marketing, 121.
- obstetrics, veterinary, 397.
- plants and man, 314.
- poultry diseases, etiology, diagnosis, and treatment, 539.
- poultry feeding, 388.
- poultry husbandry, 388.
- protozoa in biological research, 784.
- textile fibers and materials, 281.
- textiles, 141.
- timbers, commercial, of United States, 203.
- veterinary history, American, 815.
- wildlife conservation, 81.

***Boophilus*—**

- annulatus microplus*, biology and effect of arsenical dips, P.R. 799.
- australis*, life history, 800.

Borate-vitamin B₆ complex formation, 583.**Borax, herbicidal behavior, Calif. 618.****Borax studies, Mass. 752.****Bordeaux mixture for potato spraying, effect of varying copper lime ratios, 634.****Border disk for rapid raising of high water-controlling borders, Ariz. 257.*****Borealis* susceptibility to infection by type A milky disease, 512.****Borers, longhorned and flatheaded, on fire-killed coniferous timber, 792.****Boron—**

- and calcium metabolism, effect on corn, 167.
- and thallium toxicity of tobacco, relation, 74.
- availability, soil factors affecting, 167.
- deficiency disease in cabbage, 773.
- deficiency in alfalfa, West.Wash. 488.

Boron—Continued.

deficiency in pine seedlings in water culture, 373.

deficiency problem, Wis. 488.

effect on internal break-down of beets, [N.Y.] Cornell 633.

in feeds and food, Ky. 852.

nutrition of *Brassica* spp., Me. 631.

problems of apple orchards, 214.

rapid microdetermination, 208.

role in diet of rat, 698.

starvation of plants, control, 631.

studies, Hawaii 160.

use in apple orchards, 496.

Botanical—

dictionary, Swahili-English Latin, 23.
experimentation, comparison of methods, 23.

microtechnic, 30.

problems in boreal America, 451.

type specimens, care and housing, 170

works of Société Royale du Canada,
bibliography, 593.

Botanists, Arizona localities of interest to U.S.D.A. 170.

Botfly, sheep, in lambs, 88.

Botryosphaeria ribis chromogena, notes, N.J. 78.

Botrytis—

cinerea, pathogenic to potatoes, 210.

core rot of gladiolus, 638.

infection of lettuce, control and relation to damping-off and mildew, 361.

stem rot of greenhouse tomato, U.S.D.A. 204.

studies, 771.

Botulinus-toxin-producing areas in duck marshes, detection and control, 674.

Botulism—

in ducks in Philippines, 405.

in poultry, effect of sulfanilamide, Kans. 104.

Box tree culture, diseases, and pests, U.S.D.A. 201.

Boxelder bug feeding habits, 502.

Boys—

adolescent, attitude toward punishment, 267.

adolescent, dislikes regarding parental behavior, 267.

junior, body sizes for, work of ASA clothing committee on, 142.

suits, buying, U.S.D.A. 862.

Boysenberry (ies)—

adaptability tests, Hawaii 190.

canker and dieback, Idaho 769.

culture in Ohio, Ohio 482.

frozen-pack, vitamin C in, Wash. 556.

Brachymeria tegularis as hyperparasite of differential grasshopper parasite, 798.

Brachyrhinus ovatus, see Strawberry root weevil.

Brachyrhinus sulcatus, see Vine weevil, black.
Bracken fern, control, West.Wash. 471.

BRAIN and digestive system of cats, formulas for measurements, 466.

Bramble cane gall, cause, 215.

Bramble virus diseases, Wash. 484.

Brandy, cognac, manufacture, 301.

Brassica genus, mineral nutrition, Me. 631.

Bread—see also Flour.

white, composition and energy value, 691.

Breeders' cooperatives, organization and operation, 327.

Breeding, see Plant breeding and specific animals and plants.

Brevicoryne brassicae, see Cabbage aphid.

Broccoli—

carotene in, determination, 564.

cooked fresh, vitamin C in, 705.

storage, 346.

Bromegrass(es)—

action of invertase at various hours of day, 320.

as dry-land pasture crop, Mont. 473.

breeding, Iowa 182.

culture experiments, Wyo. 43.

invading sheep and cattle ranges, Nev. 472.

legume pasture, yields and grazing days from, Wis. 522.

pasture, relative merits, Wis. 471.

production, Nebr. 184.

seed yields, effect of seedling rate, Idaho 751.

smooth, for sheep, nutritive value of different cuttings, Wash. 516.

Bronchitis, infectious, studies, R.I. 815.

Broncho-pneumonia, enzootic, of dairy calves, Fla. 665.

Brooder, home-made electric, Ohio 518.

Brown rot fungus in New York, development, U.S.D.A. 357.

Brown rot isolations from stone fruits, 779.

Brucella—

abortus—see also Bang's disease.

added to soil, effect, 18.

antigen, stained, standardization for whole-blood test, 107.

bacterial disassociation in, 631.

immune response depending on route of administration to rabbits, 105.

immunization of cattle against, problems in, 607.

in living chick embryos, long-continued cultivation, 582.

infected guinea pigs, resistance and sensitivity, 665.

lipid fraction, separation and study, Mich. 531.

strain 19, and calfhood vaccination, 817.

vaccine, standardization and control, 604.

accessory-growth-factor requirement, 397.

agglutination antigen, control, 664.

antigen, standardized, field results with, 664.

antisera, maximum precipitation and agglutination of antibody, conditions for, Mich. 580.

biologically active carbohydrate from, 398.

Brucella—Continued.

- cells, capsule on, Mich. 530.
- cells, immunizing value of gluco-lipid antigen from, Mich. 530.
- infection in swine, 664.
- sp., isolation, cultivation, and differentiation, Mich. 529.
- strain 19 in vaccinated calves, persistence of, 527.

Brucellin—

- calibhood vaccination against, stage of control, 817.
- chronic, *Brucella*, *Pasteurella tularensis*, and *Protus agglutinus* in, 665.
- in horses and goats, 527, 816.
- in wildlife, 817.
- leucocytic picture in, Mich. 531.
- possible relation to periodic ophthalmia, 817.

progress made in study, 253.

Bruchus pisorum, see *Pea* weevil.**Brunchorhiza destruens**, conidial stage of *Crumenula abietina*, 373.**Brussels sprouts**, fresh, vitamin C in, 705.**Bubakia crotonis**, morphology, 315.**Buckeyes**, chemical composition, 725.**Buckthorn**, sea, vitamin C-rich fruit suitable for marmalade, 709.**Buckwheat**—

- Tartary, a new grain, N.Y.State 756.
- taxonomy, 315.

varieties and production, Pa. 754.

Bud moth parasites, effect of sprays, N.Y.State 794.**Buffalo grass**—

- breeding, Kans. 40.
- culture experiments, Kans. 40.
- moisture conservation for, 337.
- seed production and germination, Kans. 41.
- seed, soaking as aid to germination, 340.

Buffalo treehopper, studies, Iowa 218.**Bull(s)**—see also *Sire(s)*.

- associations, stud, Idaho 809.
- dairy, ability to withstand regular service for artificial insemination during one year, 327.
- effect of thyroidectomy on sexual behavior, 30.
- Holstein, useful life span, 656.
- semen, amount and quality, effect of exercise, 519.
- semen, evaluation of fertility, 519.
- semen, preservation and handling, developments in, 749.
- sperm metabolism, effect of inhibitors and activators, 468.
- spermatozoa, storage, 657.

Bunostomum—

- phlebotomum* in calves with tropical diarrhea, P.R. 821.
- trigonocephalum* in sheep, 670.
- trigonocephalum*, treatment with repeated doses of phenothiazine, 536.

Bunt, see *Wheat smut*, stinking.**Burnet studies**, Calif. 40.**Burrowed food reserves**, relation to control, *Ariz.* 608.**Butler**—

- acids in and their distribution, *Iowa* 238.
 - aroma compounds in, effect of growth of *Pseudomonas putrefaciens*, 520.
 - cold-storage costs at terminal markets, *Kans.* 117.
 - consistency, 244.
 - crumbliness and stickiness in, 245.
 - culture, development from mixtures of organisms, *Iowa* 238.
 - cultures, mechanism of dissimulation of carbon sources, *Iowa* 238.
 - cultures, preparation for mail shipment, *Iowa* 238.
 - Dutch factory, thiocyanogen number, 245.
 - from sweet cream v. sour cream, firmness, 244.
 - moisture and fat in, control, 238, *Oreg.* 244.
 - mold mycelia in, 394, 521, *Ind.* 102.
 - plate count examination, experimental error in, 812.
 - print, wrapping, avenized v. standard parchment for, 245.
 - quality, effect of cows' rations, *Miss.* 523.
 - quality, effect of neutralizers, *Iowa* 239.
 - rabbit defect in, 396.
 - returns from \$100 spent for feed, *Iowa* 262.
 - ripened unsalted, flavor in, *Iowa* 238.
 - salt distribution in, on micro basis, *Iowa* 238.
 - sectional contamination defect in, 662.
 - setting, 244.
 - starter for, preparation, *Oreg.* 245.
 - stored at low temperature for six years, keeping quality, 521.
 - surface taint in, relation to water supplies, 306.
 - toxic, cause of trembles in sheep, 401.
- Butterfat**—
- and free fatty acid mixtures, *Mojonier* test of, 158.
 - content and minerals in milk, correlation, 240.
 - fatty acid fractions, nutritive value, 413.
 - free fat acids, effect on curd tension of milk, 659.
 - in dermatitis-producing diets, 276.
 - in skim milk, methods of analysis, 238.
 - iodine number, effect of fat in ration, 526.
 - percentage, effect of season, *Ariz.* 655.
- production—
- effect of dietary fat, 100, 519.
 - effect of glucose feeding, 519.
 - effect of roughage feeding, *Utah* 717.
 - effect of sustained high fat intake, 519.
 - studies, 391.
 - separation from milk for determination of properties, 444.
 - yearly records, calculating methods, 393.
 - yield of dairy cows, causes of variation in, 392.

- Buttermilk**—
 cultured, starter for, preparation, Oreg. 245.
 cultured, wheying off, 812.
 dried, productive energy in fowls, Tex. 388.
 fat losses in, effect of neutralizers, Iowa 239.
- Buttonclover**, production tests, Tenn. 470.
- Cabbage**—
 adaptability, effect of mineral deficiencies, Fla. 619.
 and beets, varietal differences to boron deficiency, Wis. 488.
 aphid, unusual infestation of, 785.
 ascorbic acid in, 424.
 black rot control, Wis. 488.
 black spot outbreak, U.S.D.A. 64.
 boron deficiency disease in, 773.
 classification as to caterpillar injury, U.S.D.A. 501.
 curculio, studies, Wis. 503.
 disease control, new development, 492.
 disease-resistant varieties, development, Wis. 478.
 fertilization, La. 761, R.I. 753, S.C. 48.
 insects, control, N.Y. State 789.
 maggot, control, Mass. 787.
 maggot insecticide tests, Idaho 786.
 marketable, derris residue on, 220.
 mosaic, two viruses responsible for, Wis. 488.
 plants, residual effects of forcing and hardening, U.S.D.A. 49.
 ring necrosis, 773.
 seed production, Del. 47.
 small, proximate analysis and value of its proteins, 412.
 small, vitamin D in, 425.
 variety tests, Ky. 761.
 vitamin C in, 705.
- Cabbageworm(s)**—
 biological control, Hawaii 218.
 imported, concentrations of derris sprays for, 785.
 southern, notes, Tenn. 502.
- Cacao**—
 beans, insect infestation in producing countries, 643.
 nonparasitic diseases, and agents, 215.
 production and trade of world, U.S.D.A. 679.
 swollen-shoot virus disease, 368.
 trees, pollination in Trinidad, 765.
- Caecocia argyrosipila*, see Fruit tree leaf roller.
- Cactus**—
 borer, studies, Kans. 84.
 control by crushing with heavy roller, Wyo. 43.
 eradication, Tenn. 471.
 giant, bacterial necrosis, Ariz. 620.
 plants of Arizona, 452.
 plants, white grub destroying, as aid in range improvement, Colo. 512.
- Cadelle**, seasonal variation in resistance to high temperature, 499.
- Cages, knock-down**, for laboratory and field studies, U.S.D.A. 501.
- Cake(s)**—
 high-sugar-ratio, quality and economy in, 846.
 making, fresh and storage egg studies in, 846.
 sponge, use of dry milk solids in, 691.
 yellow sponge, factors of concern to commercial baker, 558.
- Calcium**—
 and magnesium conservation, Tenn. 445.
 and potassium metaphosphates availability, Del. 13.
 arsenate, injurious effects on soils, Miss. 337.
 arsenate, toxicity to bees, 228.
 deficient rats, fasting catabolism and food utilization, 417.
 effect of rates of application and forms on tobacco yield and quality, S.C. 42.
 effect on availability of phosphorus, 280.
 effect on plant tissues, 155.
 in cotton plant, 455.
 in green v. bleached vegetables, Miss. 556.
 ion as an antagonist, function of, Mass. 720.
 metabolism of corn, boron as factor, 167.
 of taro, utilization in diet, 123.
 of vegetables grown under known conditions of fertilization, 556.
 phosphorus ratio, dietary, relation to iron assimilation, 417.
 phytate as source of calcium, 279.
 phytate, ionization, 697.
 prevention of fertilizer injury to germination by, 22.
 radioactive, biological studies, 416.
 radioactive, metabolism in pregnant mice, 416.
 relation to tobacco growth, Conn. [New Haven] 760.
 requirements of growing pigs, 803.
 serum, of guinea pigs with scurvy, 278.
 serum, values in infancy, 696.
 silicate slag, solubility, Tenn. 445.
 silicate slag, value as agricultural liming material, Ala. 445.
 transfer from mineral to plant through colloidal clay, 15.
 utilization in animal body, effect of ferric chloride, 417.
 utilization in vegetables v. in milk, 127.
- Calf(ves)**—
 beef, wintering on rations of different phosphorus content, Tenn. 516.
 birth weight and performance, relation to age and breed, Fla. 604.
 copper in tissues, relation to nutrition of dam, Fla. 652.
 fattening, calcium in nutrition of, Kans. 94.
 fattening, corn v. beet products, Idaho 801.
 fattening, soybeans v. soybean meal for, Ohio, 803.

Calf(ves)—Continued.

- fed alfalfa hay, cod-liver oil as supplement, 301.
 for slaughter and breeding, creep feeding v. noncreep feeding for, S.C. 92.
 from native cows and beef-type bulls, Miss. 383.
 heavyweight and lightweight yearling, comparison, Kans. 92.
 individual limited and full-feeding, results, 381.
 magnesium requirements, Mich. 101.
 mortality rates in Great Britain, 101.
 newborn, blood plasma vitamin A content, relation to calfhood diseases, 520.
 newborn, distribution of trace elements in, effect of nutrition of dam, Fla. 802.
 on alfalfa pasture, death losses in, Ariz. 664.
 raising, dehydrated cereal grass and fat substituted milk for, Kans. 98.
 red clover hay for, high v. low phosphorus, 382.
 use of energy in rations, effect of variations in protein level, 233.
 whole milk sham-fed to, changes in, S.C. 98.
 wintering, alfalfa with and without grain for, Idaho 801.
 (California Station, report, 143.
 (California University, notes, 431.
Callosobruchus maculatus, see Cowpea weevil.
 Calorimeter for measurement of heat produced by fruits and vegetables, U.S.D.A. 546.
Calosoma beetles, enemies of sugar beet wire worm, 513.
 Cambium of trees and shrubs, origin of ray initials in, 168.
Camellia, *Botrytis* spotting, Calif. 65.
Camellia dieback of unknown cause, Fla. 620.
 Camphor, action on horses, 528.
Campylopus verbasco control, in Nova Scotia apple orchards, 786.
 Canary grass—
 evaluation for sound pasture program, Wis. 522.
 vegetative growing points, studies, 43.
 Canary pox—
 pathology and transmission, 114.
 studies, 664.
 Cankerworms, studies, Kans. 84.
 Canna bacterial bud rot, Ariz. 628.
 Cannibalism in poultry—
 relation to bulk and fiber and form in which ration is fed, West.Wash. 518.
 salt for prevention, Wis. 516.
 Cantaloup, see Muskmelon(s).
 Capillaria—
 contortia in crows, 82.
 spp. in grouse, 406.
 spp. in partridge and pheasant, 82.
 Captophorus—
 fragaeformis, see Strawberry aphid.
 spp., notes, 641.
 Capons, purebreds v. cross-breds, Mich. 653

Capreolus mantohuricus, subcutaneous myiasis of, 528.

Carbohydrates—

- analysis, ceric sulfate method in *Lepidium* and *Convolvulus* roots, 5.
 carbohydrase synthesis, effect of ethylene, 456.
 combustion in man after food intake, 694.
 Carbon dioxide—
 participation in metabolism, 456.
 radioactive, absorption and use by sunflower leaves, 457.
 Carbon disulfide injected into soil to kill rootstocks, diffusion of, Calif. 40.
 Carbonic anhydrase, relation to zinc, 583.
 Cardinal, eastern, *Tetramesa americana* in, 640.
 Carnation(s)—
 Alternaria dianthi blight, Mass. 769.
 Fusarium wilt, R.I. 770.
 greenhouse, onion thrips on, Wash. 503.
 inheritance of flower color, 34.
 shoots, maggot attacking, 785.
 soils, liming, Mass. 762.
 yellows, Wash. 488.
 yield and quality, effect of watering and phosphate, 60.
 Carotene
 and allied pigments, constitution and physiological significance, 7, 8.
 content, genetic selection for varietal differences in, Me. 691.
 content of alfalfa, preservation methods, Idaho 724.
 determination, effect of carbohydrates, 8.
 in blood plasma of dairy cows, 519.
 in carrot, effect of habitat and fertilization, 699.
 in cattle blood plasma, 233.
 in dried spinach, determination, 441.
 in egg yolk, relation to ration, 806.
 in feeds, factors affecting, S.C. 98.
 in foods and feeding stuffs, 8.
 in fresh and frozen vegetables, determination, 564.
 in plant material, determination, 583.
 in South African feeding stuffs, 801.
 in white clover, effect of leaf rust, 492.
 intake, restricted, reproductive performance, 233.
 isolation from green plant tissue, 152.
 loss in machine-dried alfalfa meal under variable conditions of storage, 801.
 losses in hay, factors affecting, 740.
 metabolism in rats, effect of linoleic acid, Ala. 564.
 oxidase, coupled oxidation of carotene and fat by, 274.
 requirements of dairy cattle for lactation, 520.
 requirements of dairy cattle for reproduction, 391.
 requirements of laying hens, and chicks, Idaho 800.

- Carotenoid(s)**—
 of yellow peach, 440.
 passage from food to milk in cow, 100
 pigments in citrus juices, U.S.D.A. 154.
Carpenterella mollinea n.g. and n.sp., description, 216.
- Carpet grass pastures**—
 carrying capacity and nutritive value for
 heifers, Fla. 651.
 studies, Fla. 609.
- Carpocapsa pomonella*, see Codling moth.
- Carrot(s)**—
 as green feed substitute for poultry, Mich.
 235.
 boron in, Ky. 852.
 fungus storage rots of, Idaho 769.
 seed production, Idaho 701.
 varieties, Wis. 478.
 wilt, varietal susceptibility, Wis. 488.
- Caryospora putaminum*, life history, Md. 168.
- Caseln**—
 acid, preparation for use in ice cream,
 520.
 productive energy in fowls, Tex. 388.
- Castanea*, male sterility in, 198.
- Castor-bean(s)**—
 calcium oxalate crystals, development
 and distribution in, 169.
 oil content measurements, Idaho 724.
 tick, clinical manifestations, 800.
 variety tests, Ariz. 608, Ky. 751.
- Cat(s)**—
 central nervous system and digestive
 system, measurements, formulas for,
 466.
 prenatal growth, 466.
- Catalase**, blood and milk, effect of sulfanila-
 mide on, S.C. 105.
- Catalpa sphinx*, control, Ala. 499.
- Cataract**, galactose—
 in rats, nature of protective factor, 272,
 273.
 time factors in development, Mass. 845.
- Catfish**, channel, survey, Iowa 217.
- Cattle**—see also Calf(ves), Cow(s), Heifer(s),
 Livestock, and Steers.
 beef—
 and dual-purpose breeds, milk pro-
 duction, Fla. 604.
 and dual-purpose, pastures and
 supplements for, Fla. 651.
 cycle, as tool in situation analysis,
 limitations, Okla. 677.
 feeding, Ga. 652.
 growing and finishing rations for,
 Tenn. 516.
 herd wintering, Fla. 651, Miss. 143
 management, 382.
 pasture, shade for, Tenn. 516.
 pen fattening, Hawaii 231.
 prices and number, relation, Okla.
 677.
 prices received by farmers, and fac-
 tory payrolls, Okla. 677.
 returns from \$100 spent for feed,
 Iowa 262.
- Cattle**—Continued.
 blood plasma, carotene and vitamin A in,
 233.
 breeding and performance, Fla. 604.
 coat color, relation to absorption and re-
 flection of solar radiation, 327.
 cobalt and copper deficiency in, Fla. 665.
 cobalt requirements, soil and plant rela-
 tions, Fla. 689.
 dairy—see also Cow(s).
 carotene requirements for lactation,
 520.
 effect of complex mineral and vita-
 min mixtures, Mass. 809.
 feeding experiments, Tenn. 521.
 genetics, 239.
 individuality of digestive power, 655.
 judging, U.S.D.A. 239.
 physiology of, 810.
 producing ability in, estimation, 99
 rations, roughage alone v. roughage
 plus concentrates, West. Wash.
 521.
 type and producing ability, relation,
 523.
 vitamin D deficiency, relation to
 mineral intake and sunshine, 519.
 vitamin D requirement, 519.
 diseases, see specific diseases.
 fattening, alfalfa hay for, N.Mex. 231.
 fattening and meat production, effect of
 Ca and low-P rations, Kans. 92.
 feeding, costs and returns, Iowa 202.
 feeding program, planning, Iowa 84.
 feeding records and net returns, N.Mex.
 263.
 flukes in, treatment, 535, Hawaii 247.
 grub control, Ariz. 664.
 Holstein-Friesian, inbreeding, Iowa 176.
 Indian, and their development, 657.
 Indian, improvement, 810.
 internal parasites, P.R. 821.
 plague, see Rinderpest.
 poisoning, see Plants, poisonous, and spe-
 cific plants.
 range, artificial insemination in, 327.
 range, Ca and inorganic P in blood from,
 N.Mex. 231.
 reproductive activity and disease resist-
 ance, effect of mineral deficiencies,
 Nev. 527.
 role of vitamin E in growth and repro-
 duction, 385.
 sodium chlorate poisoning in, 820
 therapeutics, 527.
 ticks, see Tick(s).
 time of ovulation and rate of spermato-
 zoa travel in, 328.
 time of ovulation in, 239.
 wheat feeding experiments, 385, Oreg.
 802.
 Zebu cross, possibilities in North Aus-
 tralia, 464.
- Cauliflower**—
 ascorbic acid in, 424.
 plants, residual effects of forcing and
 hardening, U.S.D.A. 49.

Cauliflower—Continued.
storage, 346.

Cebion, orange juice, and sprouted oats as source of crystalline ascorbic acid, Kans. 126.

Cedar blight, U.S.D.A. 204.

Celery—

blackheart, effect of boron in greenhouse soil, R.I. 770.

boron in, Ky. 852.

cabbage, Chinese, as supplement to cereal diet, 412.

cabbage, Chinese, carbohydrates in, 412.

damping-off, control, Fla. 629.

diseases, studies, Fla. 629.

early blight and causes of seedbed failures, Fla. 629.

late blight, in Virginia, U.S.D.A. 629.

leaf blights, spraying for, Mich. 65.

leaf rusts, in North Dakota, N.Dak. 771.

ontogeny of medullary bundles in, 32.

quality, factors determining, R.I. 762.

soil and fertilizer requirements, Fla. 619.

Cell—see also Plant cell(s).

and protoplasm, symposium, 453. 461.

lengths in terminal meristematic region of stem, relation to tallness and dwarfness, 168.

walls, fiber-bonding materials and importance in pulping, 460.

Cellulose—

fermentation by micro-organisms associated with termites, 174.

fibrils, diameter variation in, 581.

Cements, tests for sulfate resistance, Minn. 675.

Cenangium abietis and *Brunchia destrucens*, distinct species, 373.

Centipede(s)—

garden, as greenhouse pest, 786.

garden, studies, Calif. 84.

Cephaleuros mycoides on guava, control, Fla. 620.

Cephalosporium—

acromonium of fig, 768.

ulmi spores, distribution by sap stream in elm, 781.

Cephus cinctus, see Sawfly, wheat stem.

Cephus pygmaeus, see Sawfly, European wheat stem.

Ceratomia catalpa, see Catalpa sphinx.

Ceratostomella—

disease of sycamore, Mass. 769.

montium n.sp. associated with *Dendroctonus* spp., 782.

ulmi, notes, 688.

ulmi spores, distribution by sap stream 781.

ulmi, susceptibility of American elm v. exotic species to, 782.

Ceroospora—

api early blight of celery, Fla. 629.

capsici leaf spot of peppers, La. 769.

leaf spot, La. 769.

leaf spot and resistant strain of Blue Rose rice, La. 772.

musae, notes, 497.

Cercospora—Continued

musae, perfect stage of, 388.

n.sp., description, 357.

nicotianae leaf spot of tobacco, Ky. 769.

phaeochlora discovered in Chile, 206.

sesami blight control, hot water seed treatment in, 768.

Cereal(s)—see also Grain(s) and specific grains.

and rickets, 270.

bends, a new disease of, 632.

diet, Chinese celery cabbage as supplement, 412.

disease-resistant, developing, Calif. 65.

diseases, Kans. 65, U.S.D.A. 357, 628.

diseases, seed treatments for control, Wyo. 69.

heading and flowering, physiological condition during, 453.

plants, fresh v. aged, palatability, Kans. 98.

root rot, control, N.Dak. 69.

root rots, *Fusarium* spp. associated with, U.S.D.A. 204.

root rots, notes, 632.

rusts—see also Rust(s) and specific hosts.

action of organic compounds as spray against, 359.

in India, 632.

in Texas, U.S.D.A. 628.

unusual development, U.S.D.A. 64.

straws, increasing feeding value, 651.

Cerebrospinal fluid—

pressure and vitamin A deficiency, 241.

pyruvic acid in, 852.

Ceresa bubalus, see Buffalo treehopper.

Cestodes—

fowl, new intermediate hosts, 499.

in ruffed grouse, 405.

Centorhynchus rufae, see Cabbage curculio.

Chaberia ovina, test of phenothiazine against, 401.

Chaetanaphothrips orchidii on citrus, Fla. 642.

Chaetodacus ferrugineus dorsalis, effects of temperature and soil moisture on adult emergence, 798.

Chalcodermus aeneus, see Cowpea curculio.

Chamiza, range reseeding trials with, N.Mex. 613.

Changa parasite *Lurra americana*, establishment in Puerto Rico, 220.

Chapote, yellow, host of Mexican fruitfly, U.S.D.A. 648.

Cheese—

and cheese boxes, correct branding in Canada, 397.

brick, control of early gas in, 662.

canning for storage, Wash. 521.

Cheddar—

American, quality, relation to acidity, 521.

American, quality, relation to curing temperatures, 246.

curing of five-pound prints, effect of temperature and covering, 103.

Cheese—Continued.

Cheddar—Continued.

disappearance of rancidity, relation to organisms, Iowa 238.

lipase induced rancidity, effect of proteolysis, 662.

manufacture, relation to bacteriophage, 396.

quality, effect of homogenization of milk for, Idaho 809.

rusty spot in, organisms causing, N.Y.State 814.

cottage, commercial, survey, 521.

cream, device for measuring body of, 246.

cream, quality, 521.

cream, quality, composition, and yield.

effect of fat, 396.

cultures, mechanism of dissimulation of carbon sources, Iowa 238.

curd, consistency at pitching point, effect on finished product, 813.

factory, establishing in Texas, fundamental considerations, 814.

foreign, production in America, N.Y.State 246.

foreign varieties, manufacture, ripening, and development, Wash. 521.

hard, ripening, bacteriology and enzymology, Iowa 238.

making, slowness in, causes, 814.

manufacture, problems in, N.Y.State 245.

manufacture, starter cultures for, 813.

processed pasteurized, procedure for making, N.Y.State 246.

Provolone type, making, 663.

Roquefort type, defects of, 394.

Roquefort type, ripened in cans under gas control, 238.

smoked, making, 663.

soft, similar to cream cheese, method of making, 521.

starter for, preparation, Oreg. 245.

Streptococcus pyogenes in, survival 527.

suitable to Washington conditions, development of special varieties, Wash. 521.

Swiss, micro-organisms associated with, 814.

Swiss, starter cultures, activity and heat resistance of, 662.

vapor pressure, estimating, 813.

volatile acids in, determination, 726.

Chellosis treatment with synthetic vitamin B₁₂, 423.

Cheliospirura spinosa in grouse, 405, 406.

Cherry (ies)—

aphid, black, insecticides containing dinitro for, Wis. 503.

ascorbic acid in, 424.

cocktail demonstration sale, result, 848.

diseases, estimated reduction in yield from, U.S.D.A. 769.

freezing, varieties for, N.Y.State 847.

fruit, growth stages, N.Y.State 764.

fruitfly control, 86.

fruitworm, life history and control, Wash. 503, West.Wash. 503.

Cherry (ies)—Continued.

leaf spot, N.J. 368.

mottle leaf, a virus disease, 730.

scald of nursery stock due to *Bacterium syringae*, 214.

Sclerotinia spp. affecting, 214, 770.

sour, fruiting habits and orchard practices, N.Y.State 195.

sour, production, Kans. 48.

sour, pruning, Kans. 48.

trees, glaze-damaged, top rot in, 70.

trees, vein clearing, a transmissible disease, 214.

yellows in New York, 76.

Chestnut(s)—

chemical composition, 725.

Oriental species, recognized and potential varieties, 58.

Chick(s)—

adsorbing charcoal in diets, 96.

amino acid requirements, 389.

auto-sex linkage in, 748.

blood, clotting ability, effect of vitamin K in hen's ration, 807.

body form in, 653.

carotene requirements, Idaho 800.

day-old, sexing, type variations, 748.

effects of colchicine on development, 603.

embryo(s)—

Barred Plymouth Rock, history of melanophores in wing skin and feather germs, 603.

carbohydrate metabolism, 96.

creeper, limb bud transplantations, 603, 605.

developing, increased mortality in riboflavin-deficient eggs, 603.

development of mouse melanophores in coelom of, 603.

effect of carbohydrates and inhibitors of heterotaxia in, 603.

effect of thyrotropic hormone, 604.

gonad development, effect. of sex hormones, 468.

inhibition of oxygen consumption in, 603.

mortality, effect. of formaldehyde fumigation, Ky. 815.

oxygen consumption at various stages, 320.

sex differential in, utilization of shell calcium by, 654.

embryonic injection of oestrogens, sexual modifications following, 604.

from hens fed different protein levels, hatching weight, 389.

growth factors in cartilage for, 804.

growth rate, effect of selenized grain, 113.

growth rate increased from high-protein ration, Wis. 516.

inattention in, effect of androgens, 180.

normal and on deficient diet, growth of endocrine glands and viscera, 602.

nutrition and vitamin B₁₂, 96.

nutrition, production and role of sterols in, Iowa 231.

Chick(s)—Continued.

- nutrition, role of arginine and glycine in, 804.
- out-of-season hatching, N.J. 518.
- pantothenic acid requirement and amount in feedstuffs, 806.
- pineapple sirup v cane molasses for, Hawaii 231.
- potassium requirements, 390.
- protein requirements, Wash. 516.
- pullet, vitamin D₃ requirement, 654.
- range crops and grass silage for, Kans. 92.
- sexing, Wyo. 93.
- sexing, profitability, Wyo. 93.
- stripped tendon in, *see* Perosis.
- soybean meal and eggs as protein supplements for, Wis. 516.
- starting mash, variations in cereal content, Wash. 516.
- tissues, pantothenic acid in, 442, 807.
- treatment with radiant energy and effect on leucosis, Iowa 247.
- used for estimation of vitamin D, variability, 807.
- viability and weight, effect of shipping and time without feed, 390.
- vitamin A requirement, Md. 231.
- vitamin A storage in, Md. 231.
- Chicken(s)—*see also* Chick(s), Cockerels, Fowl(s), Hen(s), Poultry, and Pullets.
- bedbug, Brazilian, biology, 87.
- brouler(s)—
 - battery-raised, effect of grits on, Oreg. 806.
 - battery-reared v. floor-reared, Oreg. 804.
 - cross-bred, efficiency of feed utilization by, 466.
 - production, crossbreeding for, Ark. 653.
- carcass quality, relation to physical measurements, 97.
- frozen, quality, effect of storage, U.S.D.A. 237.
- meat, boning, curing, and smoking, 237.
- meat, riboflavin in, effect of cooking, 857.
- meat type, selection, length: weight ratio as index, 383.
- palatability studies, Iowa 208.
- roasters, of two weight classes, edible meat from, 845.
- roasters, purchased v. cross-breds, Mich. 653.
- tissue, riboflavin in, effect of amount in diet, 274.

Chicory—

- levulose from, Iowa 151.
- seed, growing, Mich. 615.
- tops for dairy cattle, nutritive value, Mich. 241.

Children—*see also* Boys, Girls, and Infant(s).

- farm, progress in elementary schools, Tenn. 555.
- food habits and nutritional status, Me. 691.

Children—Continued.

- from tenant and owner homes, schooling, S.C. 118.
- grade school, effect of improved nutrition on school progress, Fla. 691.
- iron balance studies, 696.
- nitrogen and mineral balances, effect of varied banana intake, 562.
- obese, basal metabolism, 126.
- preschool, vitamin C metabolism, 861.
- rural and urban, grade scores, S.C. 118.
- rural school, nutritional status and dietary habits, Fla. 691.
- school, vitamin C nutrition, tests, 571.
- vitamin A status determined by dark adaptation, 132.

Chinch bug(s)—

- maintaining live for laboratory use, 502.
- on corn, contact insecticides for, U.S.D.A. 501.
- prospects of damage from in 1941, Okla. 677.
- studies, Iowa 218, Kans. 84.

Chinchillas, psocids infesting, 217.

Chinese adults, hematological standards for, 414.

Chironomidae of Missouri, 88.

Chironomus—

- nidges, chlorinated benzenes for control, 510.
- utahensis, studies, 502.

Chlorella vulgaris growth, factors affecting, 169.

Chlorides, antagonistic action on toxicity of iodides to corn, 455.

Chlorine—

- gas injury to plants, 208.
- germicidal efficiency, effect of pH and of ammonia, 33.
- sterilization of dairy plant, 104.
- toxicity to forms of plant and animal life, 456.

Chlorochroa uhleri, effect on acre yield and grade of wheat, N.Dak. 506.

Chlorophyll—

- components, purity, effect of preparative procedure, 324.
- in wheat seedlings, effect of vernalization, 173.
- protein, Lubimenko extracts of, 457.
- storage by plants and their development, relations, 457.

Chloropicrin lethal diffusion patterns in soil and plant organs, R.I. 770.

Chlorosis—

- and chlorotic streak of sugarcane, 488.
- in apple trees, control, relation to soil management, Wyo. 48.
- in grapes, control, 781, Utah 637.
- of macadamia, Hawaii 204.
- of shade tree, nature and control, 372.

Choanotaenia infundibulum in prairie chickens and sharp-tailed grouse, 406.

Chocolate groups, bacterial content, Mass. 810.

- Choerostromylus pudendotectus*, notes, 823, 824.
- cholesterol in brain of vitamin E-deficient chicks with encephalomalacia, 673.
- Choline as member of vitamin B₆ complex, 560.
- Chloropidae of Oriental region, 647.
- Choriohemangioma of bovine allantois-chorion, 820.
- Chortophaga viridifasciata*, false stablefly in living nymphs of, 88.
- Chromosome(s)—
- doubling by colchicine treatment, 462.
 - meiotic, minor coil in and associated phenomena, 746.
 - morphology in sunflower, 468.
 - number, aberrant, and sterility in rice, 601.
 - number in gladiolus hybrids, 176.
 - number in *Quercus*, 464.
 - of teosinte, knob positions on, 601.
 - staining, new method, 326.
- Chrysanthemums—
- in garden, frame, and greenhouse, variation in blooming date, 60.
 - new Minnesota varieties, 354.
 - response to artificially controlled day length, Ala. 477.
 - seedlings, development, effect of day length and temperature, 328.
 - use of electric light to retard blooming, Miss. 345.
- Chrysoschiza larioellae*, parasite of birch leaf-mining sawfly, U.S.D.A. 229.
- Chrysomphalus aurantii*, see Red scale, California.
- Cicada, periodical, notes, 217.
- Cider jellies and marmalades, Mass. 724.
- Cigars, good, making, use of binder tobacco with intermediate burn in, Wis. 472.
- Cimex lectularius*, see Bedbug(s).
- Cincophen, effect on gizzard erosion in chicks, 255.
- Cineraria virus diseases, Wash. 488.
- Cirrospilus* spp., biology and immature stages, U.S.D.A. 230.
- Citrates, calcifying action, relation to phytin, 560.
- Citric acid—
- anaerobic dissimulation by cell suspensions, 461.
 - determination in milk, 520.
 - metabolism in rat, 852.
 - metabolism, relation to thiamin, 274.
 - production, effect of type of carbohydrate ingested, 560.
- Citrin preparations, effect on vitamin C-deficient guinea pig, 710.
- Citricid—
- italicum, notes, 77.
 - psorosis and varieties, notes, 77.
- Citrus—
- box tests, 479.
 - brown rot, control, 369, Calif. 65.
 - bud mite, control, Calif. 83.
 - bud-shoot wilt in nursery trees, 77.
 - byproducts, feeding value and nutritive properties, Fla. 241.
- Citrus—Continued.
- canker situation, U.S.D.A. 64.
 - canker type disease, background and history, 628.
 - cases, export, testing schedule for, 479.
 - Clitocybe* mushroom rot of, Fla. 629.
 - composition and quality, effect of type and treatment of soils, Fla. 590.
 - culture in Argentina, 353.
 - disease, new root, of Brazil, 77.
 - diseases in Paraguay, 637.
 - dry root rot, Ariz. 629.
 - fruit(s)—see also Lemon(s), Orange(s), etc.
 - cold storage, Fla. 619.
 - farm prices, index numbers, Fla. 677.
 - juices, ascorbic acid in, determination, 442.
 - quality, effect of nutrients, Fla. 619.
 - quality, effect of rootstocks, 57.
 - respiration of, relation to metabolism of fungi, 744.
 - ridging, effect of fumigation with HCN, 785.
 - ripening, changes associated with, Fla. 619.
 - rooting, effect of synthetic growth substances, 107.
 - soluble solids in pulp, unequal distribution, 623.
 - sooty blotch, removal from, 478.
 - storage, Calif. 52.
 - storage, effect of wax treatments, Fla. 619.
 - varieties and breeding, Fla. 619.
 - fumigation for scales, Calif. 83.
 - groves, in Salt River Valley, winter temperatures, Ariz. 619.
 - gummosis and psoriasis, Fla. 629.
 - gummosis control, 369.
 - insect control, Ala. 409.
 - juices and pulps, preservation, Fla. 619.
 - juices, clearing, effect of heating, 300.
 - low-temperature injury, effect of nutrient deficiencies, Fla. 619.
 - malnutrition, symptoms, 337.
 - melanose and stem-end rots, Fla. 629.
 - nutrition, physiology of, Fla. 619.
 - oil emulsion sprays for, timing, Fla. 642.
 - orchards, irrigation problems in, U.S.D.A. 483.
 - P deficiency symptoms in, Calif. 52.
 - products, ensilability, Fla. 651.
 - progeny and bud selection, Fla. 619.
 - red mite, control, Calif. 83.
 - rootstock and variety tests, Fla. 619.
 - rootstocks for, and effect on quality, Calif. 52.
 - rotting fungi in culture, efficacy of *o*-phenylphenol against, 478.
 - scab control, Fla. 629.
 - scale infestations during 1940, 506.
 - scales and mites, combined control, Fla. 642.
 - soil deficiencies and their symptoms in Calif. 52.

Citrus—Continued.

- soil fertility studies with, Fla. 590.
- thrips, control, 376, Calif. 83.
- thrips, new species of *Triphleps* on, 85.
- trees, importance of root aeration in, 483.
- trees, N requirements, Calif. 52.
- trees, N uptake by, Ariz. 619.
- use of water sprays for, Calif. 83.
- varieties for lower Rio Grande Valley, Tex. 623.
- viruses, 77.
- wood, cold injured, status of melanose fungus in, 369.

Clay(s)—

- base-exchange capacity, effect of temperature, P.R. 731.
- Cecil, erodibility, effect of lime and organic matter, 164.
- colloidal, fixation of cations by, relation to ionic size, 447.
- degree of dispersion, studies, 446.
- loam, effect of fertilization on N, active phosphoric acid, and active potash, 313.
- minerals and phosphate availability, 21.
- minerals, crystal structure alterations, effect of phosphate fixation, 306.
- minerals, sorption of organic colloids by, effect of CO₂, Idaho 729.
- montmorillonitic, absorption of proteins by, and effect on base-exchange capacity, 730.
- soils, Hawaiian, sorption of potassium and ammonium, 739.
- soils, need for drainage of, Wis. 446.
- soils, over-phosphating and sulfur treatment, relation to iron starvation, 313.
- used in tank-mix nicotine bentonite sprays, 219.
- Vaiden, yields of successive crops on, effect of lime and boron, Ala. 445.

Climate(s)—see also Meteorology.

- and evaporation in Alpine and Arctic zones, 729.
- in North America, Köppen classification, 12.
- of Oregon, 159.

Climatic regions of Korea and their economy. 13.

Climatological—

- data, 303, 445.
- survey for Ohio and Wooster, Ohio 445.

Citricybe—

- mushroom rot of citrus, Fla. 629.
- tabescens*, notes, Ia. 769.

Closets and storage spaces, U.S.D.A. 143.

Clostridium—

- botulinum* in refrigerated foods, 124.
- botulinum* type C toxin in duck marshes, detection and control, 674.
- botulinum*, use of amino acids and of glucose by, 156.
- pasteurianum* strains from canned pineapple, 155.
- sp., growth factor and other nutritional requirements, 326.
- tyrobutyricum* and *C. saccharobutyricum*, differentiation, 243.

Clostridium—Continued.

- welchii*, type D, cause of enterotoxemia in lambs and kids, Tex. 535.
- welchii*, type D, production of immunity against, 401.

Clothing—

- construction and care by farm home-maker, Miss. 142.
- standard sizes for boys, A.S.A. clothing committee, work on, 142.

Clover(s)—

- adaptation and fertilizer tests, Hawaii 151.
- alsike, effect of cutting stage, Iowa 182.
- annual, establishing and maintaining in carpet grass pastures, S.C. 42.
- crimson, as winter pasture v. sorghum-corn silage for dairy cattle, Tenn. 521.
- fertilizer tests, Fla. 609.
- inoculation methods, Fla. 609.
- Ladino, studies, N.J. 184.
- leafhopper transmitting potato mosaic, Wis. 488.
- pasture for pullets, big returns from, Ohio 518.
- red—

- anthracnoses and powdery mildew, resistance to, Tenn. 487.
- breeding, Iowa 182, Ky. 751.
- cross pollination by bees, 798.
- effect of cutting stage, Iowa 182.
- flowering, Ky. 751.
- length of corolla tubes, seed setting, and hybridization, Iowa 182.
- manure and fertilizer tests, Wash. 593.
- nurse crop experiment, Iowa 182.
- resistance to fungus parasites, 771.
- Stemphylium* leaf spot, 209.
- strain tests, Mass. 752.
- strains, winter injury, effect of heavy fertilization, Iowa 182.
- value for silage, R.I. 810.
- variety tests, Iowa 182, Ky. 751, Md 182.

sowing, advanced seedbed preparation. Iowa 182.

seedlings on burned-over land, West Wash. 471.

slow-germinating strain of crimson, breeding, Ky. 751.

strawberry, value on wet, saline land as forage for sheep, Colo. 473.

variety tests, Fla. 608, N.Mex. 753, Tenn. 470, Wyo. 43.

white, carotene content, effect of leaf rust, 492.

white, selection and improvement, Del. 40.

white, strain tests, Fla. 609.

yield and quality, relation to soil, Fla. 589.

yields in mixture v. alone, Wyo. 43.

Club work, see 4-H club(s).

Cobalt—

- deficiency in cattle, Fla. 665.
- polycythemia, blood volume in, 272.

- Cobalt—Continued.
requirement of dogs on milk diet, 699.
- Coccarboxylase—
blood, determination, revaluation of method, 563.
determination, modified method, 8.
- Cocci, Gram-positive, bactericidal effect of soil bacillus on, 248.
- Coccidia—
in prairie chickens and sharp-tailed grouse, 406.
of fowls, effect of sulfaguanidine, 672.
oocysts from cattle in Alabama, 822.
- Coccidiosis—
bovine, treated with sulfanilamide, 400.
cecal, of chicks, dried skim milk and other supplements in ration, effect, 539.
in brooder house, 404.
in laying house, effect of frequency of changing straw litter, West. Wash. 539.
in poultry, effect of feeding whey mash West. Wash. 539.
in poultry, effect of sulfur feeding and accessibility to sunlight, Wis. 516.
- Coccus hyperidum*, see Scale, soft.
- Cochliomyia americana*, see Screwworm.
- Cochliomyia macellaria*, see Screwworm, secondary.
- Cockerels—
purebreds v. cross-breeds, Mich. 653.
surplus Leghorn, as broilers, Oreg. 804.
- Cocklebur, floral initiation in, 28.
- Cockroach(es)—
American, toxicity of arsenicals and sodium fluoride to, 87.
field, notes, 217.
testing insecticides against, 642.
- Cocoa—
effect on digestibility of milk proteins, 659.
powders, bacterial content, Mass. 810.
powders, cacao-red or tanninlike substances in, Mass. 809.
shell, antioxidative properties when added to milk, Mass. 810.
- Coconut caterpillar control, 515.
- Coconut pest in Seychelles, 379.
- Cocos pulposa*, kernel oil from, 294.
- Codling moth—
biology and control, Kans. 84.
cocooning habits, 795.
control, 86, 507, Ky. 786, Mich. 84.
control, bait traps in, value, 646.
control, D-X insecticide for, 795.
control, new kind, 375.
control, place of pruning in, 375.
control with light traps, Wash. 503.
dynamite sprays for, 507.
electrocutors for, Wash. 542.
emergence from two-year-old larvae, 225.
European parasites, introduction into Canada, 786.
field tests for, 375.
hibernating larvae, 794.
in Ontario, biological control, 786.
- Codling moth—Continued.
larvae, dormant, experiments with chemicals on, 507.
larvae in orchard boxes, steam treatment, U.S.D.A. 502.
lead arsenate substitutes for, Wash. 503.
on apples and pears, control, Calif. 83.
on walnuts, control, Calif. 83.
problem, recent developments, 643.
relation to Hudson Valley apple market, 375.
sprays, correct timing of, Wis. 503.
sprays for, Wash. 503.
studies, 789, Del. 84, Iowa 218, N.Mex. 219.
- Cod-liver oil—
as supplement for calves on alfalfa hay, 391.
factor hindering assimilation of vitamin E by chicks, 507.
genuine v. crystalline substance, feeding value for poultry, 654.
- Coffea arabica*, transpiration rates of whole trees, physiology, 506.
- Coffee—
agreement, inter-American, U.S.D.A. 679.
doubling of chromosomes induced by colchicine, 462.
embryogenesis in, 326.
new *Fusarium* disease, 215.
tree, fertilizers for, Hawaii 190.
tree, leaf analyses as indicators of fertilizer needs, Hawaii 190.
tree, stomatal physiology, 324.
- Colaspis*—
brunnea, see Grape colaspis.
brunnea costipennis, notes, 643.
brunnea costipennis on cranberry, Mass. 786.
- Colchicine treatment, effect on sugarcane, 459.
- Colchicum* corms, disease caused by *Pythium ultimum*, 66.
- Cold storage—
locker operations, economics of, Kans. 117.
rooms, automatic temperature control in, 479.
- Collemanite, hereditary behavior, Calif. 618.
- Colenda aequalis*, studies, Iowa 218.
- Colophora mallicorella*, see Pistol casebearer.
- Coleoptera in decadent parts of living elm trees, type of wood preferred by, 785.
- Colosporium jonesii*, notes, U.S.D.A. 357.
- Coleus leaves, effect of growth substances on absciss layer, 27.
- Coliform bacteria, aerobic dissimilation of citric acid by, 296.
- Coliform organism isolated from chlorinated water, characteristics, 33.
- Coliform organisms, detection, lauryl sulfate tryptose broth for, 105.
- College men, basal metabolism of, Wyo. 122.
- College students, expenditures and means of financing, Me. 716.

Colletotrichum—*falcatum*, notes, 768

spp., detecting latent infections by, 490

Colloidal—

clay, transfer of calcium from mineral to plant through, 15

gel system, migration of iron and manganese in, III. 15.

Collyricium fabae, immature form in crows, 82.

Color inheritance—

in black hamster, 465.

in carnation, 34

in milk of Guernsey cows, 176

in peanut seed coat, 175.

of coat of bulldozers, 746.

Colorado—

College, notes, 287.

River silt, effect on properties of Yuma mesa sandy soil, Ariz. 591.

Station, notes, 287, 718.

Colts—

growth and development, Iowa 231.

raising, economical methods, Mich. 683

Columbine borer control, 786.

Combine harvesters in Missouri Mo. 544.

Comeljen-Nasutitermes costalis, summary, 220.

Commelina-mosaic virus, Hawaiian, classification, 770.

Commodity Credit Corporation, report, U. S. D.A. 840.

Community—

American, evolution of, 554.

organization, experiment, 121.

organization, rural, Md. 410.

Concrete—

effects of soluble chemicals, determination, Minn. 675.

hardened, moisture condition in, determining, 407.

silo staves, durability test, Minn. 670.

Conifer(s)—

cotyledon numbers in, 459.

five seasons' growth of, 766.

germination reduction and radicle decay, 373.

in central Washington, ring growth in, 588.

plats, mycorrhizas and mycorrhizal fungi in, 498.

restoring to aspen lands in Lake States, U.S.D.A. 202.

seedlings, damping-off, conditions favoring, Wis. 488.

seedlings, hardening, effect of potash salts, 766.

species, period of seasonal growth, 626.

troublesome pests of, 505

Coniophora cerebella, notes, 498.*Coniothyrium*—*coffeeae* on coffee fruits, 66.*diploidiella*, studies, 497.

Connecticut—

[New Haven] Station, notes, 297.

Stations, notes, 718.

University, notes, 718.

Conopia critiosa, see Peach borer.*Conotrachelus nenuphar*, see Plum curculio.*Coniarinia*—*festucae* n.s.p., description, 647.*juniperina*, history and biology, 378.*juniperina*, studies, Kans. 84.*sorghicola*, see Sorghum midge.*Convolvulus* roots, analysis of carbohydrates in, ceric sulfate method 5.

Cooperation, farmer, in southwest Virginia, Va. 838.

Cooperative(s)—

associations among farmers and consumers, 686.

associations, farmer, in Alabama, Ala. 552.

canning associations, marketing fruits and vegetables through, Oreg. 553.

elevator associations, membership, Okla. 677.

Oklahoma, financing, Okla. 677.

Cooperia punctata in calves with tropical diarrhea, P.R. 821.*Copestylum marginatum*, notes, Kans. 84.

Copper—

and lead arsenate spray mixture, effect of lime and weathering, 52.

blood, values of sheep, 668.

deficiency in cattle, Fla. 665.

deficiencies in crops, symptoms and diagnosis, 66.

deficiencies of fruit seedlings, water culture experiments, 778.

derivatives, comparative fungicidal properties, 632.

fungicides, adherence properties, 208.

fungicides, new, tests, 771.

fungicides, tank-mixed, preparation, N.J. 359.

in biological material, 698.

in newborn calf, distribution and concentration, relation to nutrition of dam, Fla. 652.

in soils and cultivated plants, relation to white tip, 208.

in sugarcane and sorghum sirup, value, Miss. 412.

oxide, yellow, v. bordeaux as fungicide for tomato, Ky. 769.

reduced by sugars, determination, N.H. 158.

spraying and dusting materials, Del. 65.

sprays, insoluble, on potato, tests, Mich. 65.

sulfate as corrective for avocado die-back, 368.

sulfate as mosquito larvicide, lethal concentration and mode of action, 226.

sulfate, effect of soil applications in greenhouse, Fla. 619.

Copperhead, northern, in Iowa, 82.

Coprinus, developmental morphology of a species, 315.

Coprolite, new species of sulfur-oxidizing bacteria from, 19.

Coptodisca arbuticella, new species of *Mirax* parasitic on, 649.

Corn—

aercagr. changes in Iowa. Iowa 262.
and cotton rotation. La. 752.
and interplanted soybeans, spacing tests, La. 752.
and its relatives, chromosome morphology in, 462.
and runner peanuts rotating with crotalaria and native cover crops, Fla. 609.
and sorghum production, competition in, Iowa 263.
bacterial wilt, U.S.D.A. 774.
borer, European—
 control by hybrid corn and planting date, Ohio 795.
 control, dusts for, large-scale test, 508.
 effect on hybrid corn varieties, 508. in Delaware, 375.
 insecticides for, Mass. 787.
 resistance in hybrid corn, 785.
 spraying for control, 785.
 studies, 795.
boron in, Ky. 852.
breeding, Fla. 608, Idaho 751, Kans. 40, Ky. 751, Md. 182, Tenn. 470.
breeding for heat resistance, noteworthy results, Calif. 40.
breeding for insect resistance, 789.
budworm studies, Fla. 642.
calcium metabolism, boron as factor, 167.
carotenoids, changes during wet milling, Iowa 151.
characteristics, relation to industrial utilization, Iowa 151.
Costa Rica, *Leptosphaeria* on, U.S.D.A. 768.
crop, poor, pasturing with lambs, Wyo. 93.
culture experiments, Fla. 609, Kans. 40, Tenn. 470, Wyo. 43.
damping-off, seed treatment for, Ariz. 628.
deficiency symptoms, 356.
different N treatments for, comparison, Ind. 751.
diseases, estimated reduction in yield from, U.S.D.A. 769.
diseases, studies, Iowa 205, Wash. 487.
ear pests, control, 86, P.R. 85.
ear rot fungi, prevalence and distribution, U.S.D.A. 204.
ear rots, inbred lines resistant to, Iowa 205.
ear, yields, N.Dak. 42.
earworm—
 biology and control, Md. 219.
 control, Md. 793, N.J. 796.
 control with oil containing insecticides, U.S.D.A. 501.
 egg and newly hatched larva, studies, 796.
 on broccoli, control, 502.
 on lima beans, control, Tenn. 502.
 on tomatoes, Calif. 88, Hawaii 218.
 resistance in corn, Kans. 84.

Corn—Continued.

earworm—continued.
 resistance of sweet corn to, West. Wash. 503.
 studies, Kans. 84, La. 46, P.R. 85, S.C. 84.
endosperm, higher yields of hormone from, 169.
fallow methods for, Kans. 753.
farm practices for, N.C. 41.
fertilizer tests, Fla. 609, La. 752, Miss. 336, [N.Y.] Cornell 609, S.C. 42, Tenn. 471.
fertilizers and legumes for increased yields, Miss. 336.
genetic studies, Md. 182.
growing, machinery for, U.S.D.A. 115.
heat and drought tolerance in, Kans. 40.
hybrid(s)—
 adaptation tests, Wyo. 340.
 and inbred lines, seasonal root development in, 38.
 and varieties, yield tests, Del. 40.
 corn borer resistance in, 785.
 factor Z in, 320.
 in corn borer control program, 785.
 performance, Mich. 185.
 performance under European corn borer conditions, 508.
 Tennessee, lead in tests, Miss. 336.
 tests for adaptability to Colorado conditions, Colo. 476.
 v. adapted varieties, Miss. 336.
 v. open-pollinated for silage, Wis. 522.
in rotation—
 effect of tillage and green manure, Wyo. 43.
 response to fertilizers, Ind. 751, Ky. 751.
 v. continuous cropping, Tenn. 471.
inbreds, *Diplodia zeae* stalk rot-resistant, development, Md. 205.
Indian, and its relatives, origin, 462.
leaf aphid, studies, Wis. 503.
leaf aphid vector of abacá mosaic, 789.
leaf rust, in North Dakota, N.Dak. 771.
manure and fertilizer tests, Wash. 593.
maternal inheritance of chlorophylls in inbred lines, 462.
meal as grass silage preservative, 519.
meal, productive energy in fowls, Tex. 388.
number of kernels per hill for, Wis. 472.
performance tests, cooperative, Ohio 186.
pickers, efficiency, Iowa 257.
pickers, first aid for, 315.
plants, composition, effect of season, Ky. 751.
production, effect of soils and soil-management practices, Iowa 160.
production methods and equipment, Iowa 257.
protein, fractionation and characterization, Iowa 151.
research in Iowa, Iowa, 184.

Corn—Continued.

- response to trace elements on peat and muck, Fla. 609.
- root systems, measuring, lithium method, 340.
- rootworm, southern, notes, Kans. 84, La. 40.
- rotation studies, Fla. 609.
- rust, notes, La. 46.
- seed, bin- and hanger-dried, disease infection and field performance, 361.
- seed, freezing injury, effect of moisture content, Wis. 472.
- seed, storage tests with, 341.
- seed, treatment advised, N.Y.State 209.
- seed, X-ray sensitivity, effect of temperature during irradiation, 746.
- seedbed preparation and planting tests, Iowa 257, La. 752.
- seedlings, types, comparative nutrient requirements, 740.
- silage, *see* Silage.
- silk fly, notes, P.R. 85.
- sirup, dextrins isolated from, properties, Iowa 151.
- sirup, enzyme converted, properties, 247
- sirup solids, use in ice cream and ices, Mass. 810.
- smut, notes, La. 46.
- soil moisture conditions under, tensiometers for following, 340.
- Stewart's disease, *see* Corn bacterial wilt.
- storage and curing, methods, equipment, and buildings, Iowa 257.
- stored, pests of, Iowa 218.
- sweet, *see* Sweet corn.
- toxicity of iodides to, antagonistic action of chlorides on, 455.
- types for fattening steers, Iowa 233.
- varieties, La. 752.
- varieties and hybrids and improvement Fla. 475.
- variety and hybrid performance tests, N.Dak. 186.
- varieties, hybrids, and cultural practices, Ga. 185.
- variety tests, Fla. 608, Idaho 751, Kans. 40, Ky. 751, La. 752, Md. 182, Me. 609, Miss. 337, N.Mex. 183, 753, R.I. 753, S.C. 42, Tenn. 470, Wash. 471, West.Wash. 471, Wis. 471, Wyo. 43.
- various portions, protein and vitamin values, Iowa 151.
- vegetative tissues, polysaccharides of, 151.
- winter cover crops for, comparison, La. 752.
- wireworm damage on irrigated land, U.S.D.A. 513.
- yellow, feeding in chick starting rations, limitations in, West.Wash. 518.
- yellow, odor, Iowa, 151.
- yield(s)—
 - and growth, relation to environment and soil condition, Iowa 182.
 - effect of fertilizer and lime, Ga. 753.
 - effect of shelterbelt, Wyo. 43.

Corn—Continued.

- yield(s)—continued.
 - effect of storage of treated seed, Ill. 360
 - following vetch, effect of continuous and intermittent cropping, Ala. 470.
 - from once poor soil, Miss. 41.
 - increased with nitrogen, Miss. 336.
 - insects, and diseases, effect of date of planting, La. 45.
 - tests, Ill. 44, Iowa 45, Kans. 45.
- Cornell University, notes, 144, 576.
- Cornstalk disease of feeder cattle, Kans. 104.
- Cornstalks, utilization, 544.
- Cornstarch—
 - as supplement to cottonseed meal, N.Mex. 239.
 - oxidation, compounds responsible for, Iowa 151.
 - production, laboratory control technics for, Iowa 151.
- Cornus* sp. crown gall, U.S.D.A. 768.
- Correlation result, multiple, check on, 676.
- Corylus* to *Cytisus*, check-list revision, U.S.D.A. 64.
- Corynebacterium*—
 - genus, studies, 528.
 - group of bacilli, virulence, 4-day diagnostic test for, 665.
 - oris, toxin of, 668.
 - pyogenes*, ochitis and seminal vesiculitis associated with, 820.
- Coryneum berckmanii* blight of oriental arborvitae, cause and control, Oreg. 216.
- Coryphista meadii*, new pest of Japanese barberry, 793.
- Coryza, infections—
 - in chickens, sulfathiazole in treatment, 827.
 - studies, Calif. 104, R.I. 815.
- Cosmetics, hormones and vitamins in, 131.
- Cotinis nitida*, *see* June beetle, green.
- Cotton—
 - Acala, effects of different irrigation treatments, N.Mex. 183.
 - Acala, on irrigated soils, fertilizer tests, N.Mex. 756.
 - and corn rotation, La. 752.
 - angular leaf spot, Ariz. 628.
 - aphid, abundance, Hawaii 218.
 - aphid, dusting for control, U.S.D.A. 502.
 - at home and abroad, U.S.D.A. 680.
 - bolts, diurnal and seasonal variations in diameters, 169.
 - breeding, Ala. 470, Ariz. 608, Miss. 337, N.Mex. 183, S.C. 42, Tenn. 470.
 - coats for sheep, value, Wyo. 93.
 - colchicine treatment, production of amphidiploids by, 327.
 - commercial nitrogen and winter legumes turned under for, Miss. 336.
 - control in United Kingdom, U.S.D.A. 679.
 - crop, Oklahoma, quality and size, Okla. 677.
 - cultivation, primary purpose for weed control, Miss. 470.

Cotton—Continued.

- culture experiments, Ariz. 181, Miss. 337, N.Mex. 183.
- discounts, S.C. 118.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases, studies, S.C. 65.
- doubling of chromosomes induced by colchicine, 462.
- farm practices for, N.C. 41.
- farm prices, index numbers, Fla. 677.
- fertilizer(s)—
 - and legumes for increased yields Miss. 336.
 - and nutrition studies, S.C. 42.
 - sodium ion in, value, Ga. 341.
 - tests, La. 752, Miss. 336, 337, N.Mex. 183.
- fiber(s)—
 - diameter, measuring, new technic, 282.
 - in cuprammonium hydroxide solutions, microscopic examination, 282.
 - measuring length and fineness, technic and devices, Tenn. 471.
 - microscopic structure, 282.
 - shrinkage and cell wall structure, 595.
 - structure, 31.
- fla hopper, simplified instructions for control, Tex. 504.
- Fusarium* wilt—
 - and rust, relation to potash hunger, Ark. 634.
 - notes, Tenn. 487.
 - regional studies, 768.
- genetic studies, S.C. 42.
- ginning costs, 119.
- gins, cooperative, costs, N.Mex. 263.
- gins, reducing power waste in operating, U.S.D.A. 545.
- heat resistance, Ariz. 608.
- heritable female-sterile type in, 601.
- improved soil practices for, Ariz. 589.
- in greenhouse, mineral-deficiency symptoms, 768.
- increased yield of seed, relation to potash, Ala. 445.
- insects, studies, Ariz. 641, Calif. 83, N.Mex. 219, S.C. 84.
- irrigation tests, Ariz. 181, 608, N.Mex. 183.
- jassid, varieties susceptible to in Punjab, 644.
- leaf(ves)—
 - aphid, combination of insecticides for, 504.
 - under low pressures, sap expression by, 597.
 - worm, insecticides against, 504.
- lint strength, Ariz. 608.
- mattress program, U.S.D.A. 430.
- nitrogen requirements, Miss. 470.
- nutrient deficiency symptoms in, 357.
- plantation laborers, socioeconomic study, La. 266.

Cotton—Continued.

- plants in sand culture, inoculation with *Phymatotrichum* root rot, 71.
- plants, partition of mineral elements in, 455.
- price relations and outlets for American cotton, U.S.D.A. 834.
- produced in New Mexico, quality, N.Mex. 684.
- production, effect of N, P. and K for, Mass. 341, 470.
- production, labor requirements, N.Mex. 183.
- quality statistics, U.S.D.A. 684.
- response to Mg and rare elements, Ala. 470.
- response to various soil treatments, S.C. 42.
- rhizosphere, effect of organic amendments on microflora of, 208.
- root(s)—
 - aphids, control, U.S.D.A. 502.
 - excised, growth, 740.
 - rot fungus, persistence of sclerotial stage in clean fallow and nonsusceptible crop areas, 64.
 - rot resistance, field tests, 210.
- rotation studies, Fla. 609.
- sea-island, fertilizer tests, Fla. 609.
- sea-island, yield and quality, effect of seed source, Fla. 609.
- seed, *see* Cottonseed.
- seedbed preparation and planting tests, La. 752.
- situation, effects of Government loan program, Okla. 677.
- soil fertility experiments with, Miss. 470.
- southern sclerotial rot, Ariz. 628.
- staple length and percentage below middling grade, S.C. 118.
- stem blight, cause, 633.
- stem weevil, parasite of, biology, 515.
- stem weevil, productivity and longevity, role of food and its constituents, 645.
- storage in Tennessee, Tenn. 684.
- sulfur forms and crop sequence tests, N.Mex. 183.
- tests, Miss. 336.
- top dressing with potash, Ala. 470.
- uses, U.S.D.A. 835.
- varieties, La. 752.
- variety tests, Ala. 470, Ariz. 181, 608, La. 752, Miss. 337, 470, N.Mex. 183, 753, Okla. 474, S.C. 42, Tenn. 470.
- Verticillium* wilt—
 - effect of irrigation, 488.
 - notes, Ariz. 628.
 - resistance, test of progenies, Tenn. 487.
- Western Hemisphere trade in, U.S.D.A. 119.
- wet, fumigation with methyl bromide, 788.
- whitefly in the Punjab, biology, 88.
- wild, insects and spiders on, U.S.D.A. 501.
- wilt and mineral nutrition, S.C. 65.

Cotton—Continued.

wilt, effect of fertilizers and varieties, Ala. 487.

wilt plots, nematode distribution in, 768.

wilt studies, 768.

wilt symptoms and control in Brazil, 71.

winter cover crops for, comparison, La. 752, Tenn. 471.

yield (s)—

best, seedbed preparation in fall and winter for, Miss. 470.

effect of irregular stands, Miss. 470.

following vetch, effect of continuous and intermittent cropping, Ala. 470.

manure v. fertilizer, Miss. 336.

Cottonseed—

acid delinting, value, Miss. 430.

and cottonseed products, processing, Tenn. 437.

cake v. dried beet pulp for supplementing native hay for helters, Wyo. 99.

coat, anatomical structure and germination, U.S.D.A. 31.

farm prices, index numbers, Fla. 677.

in five American upland varieties, fiber studies, 474.

meal, feeding, effect on milk properties, S.C. 98.

meal for pigs, Miss. 383.

meal, productive energy in fowls, Tex. 388.

meal v. soybean oil meal for tobacco, Conn.[New Haven] 759.

oil and protein in, effect of soil moisture and fertilizers, Ala. 470.

oil, effect on hatchability of eggs, 236.

oil, molecular distillation and crystallization, 294.

oil press cake, protein extraction, Miss. 292.

treated, effect of storage in closely woven cotton bags, 768.

treated, stored without damage in cotton or burlap bags, Miss. 470.

treatment increases stands, yields, and money returns, Miss. 493.

treatment materials, mode of action, 768.

treatments, 768, N.Mex. 183, Tenn. 210.

v. soybean meal as protein supplements in dairy rations, Hawaii 238.

Country, see Rural.

Cover crops—

close growing, effect on soil erosion, Miss. 448.

orchard, studies, 481.

variety tests, Fla. 609, Wash. 471.

Cover glasses, plastic as substitute for, 460.

Cow(s)—see also Cattle and Heifer(s).

beef, effect of minerals in ration, La. 801.

beef, wintering, silages compared, Miss. 516.

dairy—

artificial insemination, Kans. 98.

carotene in blood plasma, 519.

Cow(s)—Continued

dairy—continued.

development, change in conformation and type, Utah 239.

excretion and use of ascorbic acid, 656.

in vivo vaginal pH determinations, 395.

nutrient requirements, all-hay v. hay-grain rations, 238.

protein requirements, 239.

tattooing herd numbers on udders, S.C. 98.

total feed consumption with limited components, Kans. 98.

exposure to sunlight, effect on vitamin D potency of milk, Ariz. 655.

fat production, persistency and inheritance, Iowa, 238.

fed vitamin-low diets, vitamins in rumen contents, 94.

feeding grain to, decreases profits, Wyo. 99.

lactating, and helpers, normal live weight trends in, Ariz. 655.

milk production, see Milk production.

milking all-roughage ration v. grain and hay for, Wyo. 99.

milking, protein for, molasses yeast as source, Hawaii 238.

normal and sterile, pH of vaginal mucus, 657.

reproduction, growth, and longevity in relation to age at first calving, 391.

reproduction in, relation to ascorbic acid, 178.

test, surgical anatomy, 107.

udders, see Udders.

with different lactation records, comparison, 238.

Cowpea(s)—

black-eye, Calif. 65.

curculio, studies, S.C. 84.

enslability, Fla. 651.

mosaic, studies, 209.

plants, ascorbic acid synthesis by, relation to light, 170.

seed treatment, Calif. 65.

seedlings, changes in growing region of primary roots, 325.

variety tests, Kans. 40, La. 752, N.Mex. 183, 753.

weevil, 85.

Coyote in Yellowstone, ecology, 500.

Crab apple, Bechtel, compatibility on Malling rootstocks, 763.

Crab meat—

canning, Mass. 724.

fresh, bacteriological studies, 846.

Crabro maculipennis, stocking of nesting tunnel with tipulid flies, 380.

Crambus—

hemiochrellus, studies, Kans. 84.

mutabilis, studies, Kans. 84.

spp., notes, 499.

Cranberry(ies)—

- aphid, studies, 643.
- bogs, control of weeds and shrubs in, Mass. 752.
- bogs, frost protection on, Mass. 828.
- bogs, injury from salt spray and salt in soil, 64.
- bogs, weed control in, 196.
- fertilizing and harvesting, 353.
- fruitworm, control, in New Brunswick, 786.
- fruitworm, notes, 643.
- fruitworm on blueberries, control, 510.
- fungus rots, control, Wash. 488.
- insects, injurious and beneficial, 643, Mass. 786.
- root grub, studies, 643.
- rosebloom and fruit rot, control, Mass. 770.
- sauce, use of dextrose in, Mass. 724.
- seed oil, skins and seeds, studies, Mass. 724.
- sprinkler irrigation system for, Wash. 542.
- storage research, Mass. 828.
- vine injury, relation to oxygen in winter flooding water, Mass. 762.
- weevil, studies, 643
- white grub, notes, 643

Cratichneumon tabaniformis, biology, 85.

Cream—

- better, new aids to, 394.
- body, control, physicochemical principles involved, 394.
- cans, acidifying, effect on quality, 520.
- diacetyl and acetylmethylcarbinol in, Iowa 238.
- frozen, review, 395.
- keeping quality, effect of quick freezing, 811.
- market, factors affecting body of, 528.
- market, factors influencing supply in Springfield milkshed, Mass. 830.
- mold mycelia in, 394, 812, Ind. 103.
- mold mycelia in, and effect of udder infection on test for, 521.
- pasteurized, quality, resazurin test for determining, 524.
- preserved with salt, difficulties in applying Babcock test, Idaho 809.
- quality, effect of separation methods, Ind. 812.
- response to rebodilyng process, 520.
- ripening, 102.
- sour, neutralization for buttermaking, 661.
- visual mold test for, and patron reaction to, 244.

Creamery license division, report, Ind. 812.

Cricket(s)—

- mole, bait for, Fla. 641.
- Mormon, estimating injury to forage, 376.
- Mormon, response to temperature, 217.
- snowy tree, on raspberries, control, Calif. 83.

Crioceris asparagi, see Asparagus beetle.*Cronartium ribicola*, see White pine blister rust.

Crop(s)—see also Forage crops, Root crops, and specific kinds.

- and soil management, systems of, nitrogen economy, Ala. 445.
- and soils outfield work in hill land area, La. 752.
- and stock husbandry, 239.
- changes in acreages to meet national agricultural adjustment program, Ariz. 678.
- damage by chinch bugs and grasshoppers in 1941, prospects for, Okla. 677.
- deficiencies of minor elements, symptoms and diagnosis, 66.
- effect of temperature and day length, Wis. 458.
- effect of type and treatment of soils, Fla. 590.
- effects on succeeding crops, R.I. 753.
- farm prices, index numbers, Fla. 677.
- fertilizer and legumes for, Miss. 336.
- fertilizer requirements, soil and plant-tissue tests for, 735.
- field response to available phosphorus and potash, P.R. 730.
- follage, N requirements, Miss. 344.
- hunger signs in, 356.
- insects in Portuguese East Africa, 85.
- lime requirements, 739.
- losses from plant diseases in United States, U.S.D.A. 769.
- mineral composition, relation to soils, U.S.D.A. 730.
- new, tests, Ariz. 181.
- plants, causes of failure of seed and seedlings, Fla. 629.
- production in soil and in nutrient solution, 20.
- quick-growing, for early pasturage and for nurse crops, Iowa 182.
- reports, U.S.D.A. 687.
- resistance to insect attacks, Kans. 84.
- response to fertilization, Kans. 41.
- response to trace elements on peat and muck, Fla. 609.
- responses to lime, manure, and fertilizers on different soil types, Iowa 160.
- rotations, see Rotation of crops.
- soil fertility studies with, Fla. 590.
- southern, fertilizer placement machinery for, 739.
- transplanted, starter solutions for, N.Y.State 166.
- varieties and yields, Miss. 336.
- water requirement, Calif. 115.
- wide spacing of rows v. fallows, Kans. 754.
- yields, effect of K and N, Ky. 751.
- yields, effect of weather, climograph for study, 729.
- yields under various rotation systems, Iowa, 160.

Crotalaria—

- rotation studies, Fla. 609.
- seed germination and stands, effects of scalding and exposing on soil, Ala. 470.
- variety tests, La. 752.

Crotalaria spectabilis seeds, toxicity for quail, 784.

Crow, eastern, parasites, 82.

Crown gall bacteria having normal, attenuated, and restored virulence, comparison, 66.

Crown gall organism, longevity in soil, U.S.D.A. 204.

Crocalsiella argentina n.sp. on *Panicum*, 490.

Crumenula abietina, conidial stage of, 373.

Cryolite—

- as cranberry insecticide, Mass. 786.
- toxicity to bees, 228.

Cryptus scannulatus, notes, 786.

Cucumber(s)—

- ascorbic acid in, 424.
- beetle, striped—
 - control, Mass. 787, Wis. 503.
 - insecticidal dusts for, tests, 511.
 - insecticides for, Me. 642.
- copper dusts for, Mass. 769.
- culture for pickling and pickle production, Miss. 479.
- diseases, studies, Kans. 65.
- downy mildew, control, La. 769.
- downy mildew, spray tests for, Fla. 629.
- mosaic virus cause of red pepper broom-ing disease, 362.
- mosaic virus strains pathogenic on bean and pea, 360.
- pickling, varieties and fertilization, Miss. 345.
- resistant to scab, breeding, Me. 620.
- varieties and fertilizers, La. 761.
- yield and quality, effect of climatological factors, 479.

Cucurbit-boring barid, new Philippine, 91.

Cucurbit diseases, fungicidal control, Del. 65.

Cucurbit downy mildew, control, S.C., 66.

Cucurbita pepo, translocation of organic materials in, Hawaii 190.

Cultural time, economic annuals and plants as measures of, 451.

Culture media, new paraffin-resin infiltrating and imbedding, 460.

Cunninghamia lanceolata, embryogeny, 173.

Cuprous oxide, reduced toxicity to late blight, 776.

Curculio injury, effect on dropping of fruit, Del. 47.

Current(s)—

- ascorbic acid in, 424.
- black, bushes, magnesium deficiency, 350.
- black, unfruitfulness in, 353.
- diseases, virus, 76.
- red, effect on white pine blister rust, 637.
- susceptibility to white pine blister rust, 780.

Cuscuta, see Dodder.

Cut-over lands—

- family-farm resources in, Wis. 689.

Cut-over lands—Continued.

hardwood, forest management for, W.Va. 625.

*recent settlement of, economic and physical factors in, La. 678.

Cutworm(s)—

- injurious to peaches, control, 221.
- injury and treatments, R.I. 787.
- of garden and truck crops, Me. 642.
- pale western, in southern Great Plains, control, U.S.D.A. 501.
- pale western, notes, Utah 646.

Cyanamide, time of applying to peach trees, Del. 47.

Cyanhydrin, levulose, toxicity, 106.

Cyanide poisoning, studies, 106.

Cyathus stercoreus, notes, 815.

Cyclocephala—

- borealis* in Connecticut, 379.
- susceptibility to infection by type A milky disease, 512.

Cyladinae genera and species, 227.

Cymadothea trifolii, resistance of red clover to, 771.

Cyperaceae, phylogenetic relations, 168.

Cypress, Monterey, pocket rot in, 79.

Cyrtopeltis varians, ecology, Hawaii 218.

Cysticercus pisiformis, evagination of larvae, use of bile salts for, 500.

Cystine, value as supplement to alfalfa protein for milk production, 391.

Cystitis in a stallion, 254.

Cytology, uses of Feulgen reaction in, 30.

Cytospora—

- sacchari*, physiology of, 363.
- sp. causing new fungus disease of Chinese elm, Colo. 782.

Daedalea polypores, taxonomic study, 358.

Dahlia(s)—

- cuttings, rooting, effects of talc and phytohormone treatment, 453.
- levulose from, Iowa 151.
- roots, developmental structure in, 484.

Dairy—

cattle and dairy cows, see Cattle and Cows.

degergency, role of acid cleaning agents in, 520.

drying plant, small-scale, design, 230.

equipment, acid cleaning agents for, 658.

farms, average labor income, Wyo. 118.

herd(s)—

Chatham, improvement in, Mich. 657.

effect of nutrient deficiencies, Kans. 98.

feeding and management in Texas, 391.

improvement by proved sires, Idaho 809, West.Wash. 521.

in Sweden, changes in milk yield and feed consumption, 522.

management, roughage program in, 519.

milking, open sheds v. closed barns for housing, Wyo. 99.

Dairy—Continued.

- herd(s)—continued.
 of Louisiana, reproductive efficiency, 519.
 of north Louisiana substation, history, La. 809.
 selection practiced in, intensity and kind, 34.
 management in California, Calif. 833.
 plant, chlorine sterilization, 104.
 products—
 farm prices, index numbers, Fla. 677.
 fluorescent bacteria in, 394.
 judged in National Contest, official criticisms, 103.
 Kansas, marketing, Kans. 117.
 marketed by Weber Central Dairy Association, Utah 264.
 organisms important in, classification, Iowa 102.
 quality program for, 394.
 rancid, fat test of, 158.
 standardization, Iowa 239.
 suitability for frozen pack methods, Wash. 521.
 vapor pressure, estimating, 813.
 profit, treatise, 242.
 ration, high v. low fat in, Hawaii 238.
 ration, relation of roughage to grain, Iowa 238.
 Science Association, American, papers, 518.
 sires, see Bull(s) and Sire(s).
 utensil sterilizers, electric, 394.
 Dairying—see also Creamery, Butter, Milk, etc.
 by major type-of-farming regions, trends in, U.S.D.A. 683.
 competitive position in Michigan, Mich. 833.
Dalbergia to *Erythroxylon*, check-list revision, U.S.D.A. 64.
 Dandelion control in bluegrass and Bermuda sod, use of kerosene in, Kans. 41.
Daphne *oncocum*—
 Phoma dieback of, R.I. 770.
 response to fertilizers and soils, 200.
 Dark adaptation—
 clinical testing, instruments and techniques for, 565.
 in healthy, well-nourished men, 835.
 instrument, new, for measurement of vitamin A status, 564.
 tests, clinical evaluation, 565.
Dasyneura mali, biology and control, Mass. 787.
Datana integerrima, see Walnut caterpillar.
Datana ministra, see Yellow-necked caterpillar.
 Date(s)—
 boron in, Ky. 852.
 composition and energy value, 691.
 Deglet Noor, fungal attack in, 64.
 fruit, dry weight increase curves for, 57.
 maturation and storage, Ariz. 619.
 palm decline disease of *Omphalia* root rot, 77.

Date(s)—Continued.

- spoilage, Calif. 65.
 varieties, behavior, Ariz. 619.
Datura—
 excised root growth, relation to light, 29.
 induction of pseudoembryos in by auxin treatment, 169.
 leaf and floral organs, development determined by periclinal chimeras in, 169.
 shoot apex, demonstration of three germ layers in, 173.
 southwestern perennial, intraspecific populations, relative age, 170.
Davainea proglottina in ruffed grouse, 405.
 Davenport, E., biographical sketch, 121.
 Death-watch beetle—
 biology, 645.
 injury to Old South Meeting House in Boston, 792.
 Deer—
 antler growth, effect of feeding sesame products, 652.
 parasite, new record for California, 536.
 white-tailed, foods of, 783.
 white-tailed, infected with lungworms, tissue changes in, 402.
Deggeciella spp. in crows, 82.
 Dehydroandrosterone, effect on gonad development of chick embryos, 468.
 Delaware Station, report, 143.
Delomacrisa diprionis, parasite of hemlock sawfly, 230.
Deltochereus multilobatus, new species of cecode from bird of paradise, Minn. 640.
 Democracy, challenge to, Iowa 121.
Dendroctonus—
 monticola, see Pine beetle, mountain.
 piceaperda, see Spruce beetle, eastern.
 ponderosae, see Black Hills beetle.
 Department of Agriculture, see United States Department of Agriculture.
Dermacentor andersoni, hereditary transmission of anaplasmosis by, 532.
Dermacentor variabilis, see Dog tick, American.
 Dermatitis—
 cocklebur, sodium perborate cream for, 315.
 lethal, in chickens, 255.
 Dermatology, experimental, nutritional approach, 415.
 Derris—
 leaf spot, 370.
 residue on marketable cabbage, 220.
 root infusion as tickicide for cattle and horses, 399.
 root infusion for equine and bovine scabies, 399.
 species, relative toxicities, 641.
 sprays, rosin residue as spreader for, 504.
 tubli root from Philippines, insecticidal properties, 322.
 Desert—
 range, relation to climatic and grazing conditions, Ariz. 608.

Desert—(Continued.)

- soils, Arizona, sprinkled plat run-off and infiltration experiments, 302, U.S.D.A. 164.
 soils, character, relation to genesis and morphology, 161.
 soils, soil profiles of, effect of irrigation and cropping, N.Mex. 161.
 studies, 159.
- Desmanthus virgatus*, analyses and digestibility, Hawaii 231.
- Desmella sori*, morphology, 315.
- Desmia funeralis*, see Grape leaf folder.
- Desoxycorticosterone acetate, androgenic action, 331.
- Dewberry (ies)—
 testing and breeding, West.Wash. 478.
 varieties, La. 761.
 variety and cultural studies, Tenn. 477.
 variety tests, Ky. 761.
- Dextrins, Raman spectra, Iowa 151.
- D. H. I. A conversion factors, new, by breeds. 518.
- Diabetes—
 and acetoneuria, Ky. 815.
 and thiamin, 566.
 vitamin B therapy for, evaluation, 566.
- Diabrotica—
duodecimpunctata, see Corn rootworm, southern.
vittata, see Cucumber beetle, striped.
- Diacetyl and acetylmethylcarbinol determination, Iowa 238.
- Diaphania hyalinata*, see Melonworm.
- Diaphania nitidalis*, see Pickleworm.
- Diarrhea—
 in rats, effect of feeding applesauce, 850
 of infants and children, value of banana in treatment, 692.
 tropical, in calves, relation to parasites, P.R. 821.
- Diatraea saccharalis*, see Sugarcane borer.
- 1,1-dichloro-1-nitroethane, a new fumigant, 787.
- Dicotyledons, ray structure in xylem, 173.
- Dictyocaulus* infection of white-tailed deer, tissue changes in, 402.
- Dictyosteliaceae, interspecific mixtures in, 404.
- Dicynodiamide and derivatives in soil, ammonification, 313.
- Diet(s)—see also Food(s) and Nutrition.
 deficiency diseases—see also specific diseases.
 and resistance to infection, interrelation, 252.
 deficient, experimental production of cirrhosis of liver by, 141.
 deficient, of rats, skeletal abnormalities in offspring, 465.
 healthy, 559.
 in wartime, relation to rationing, 270.
 of children, see Children.
 of infants, see Infant(s).
 proteins, effect after middle age of level of intake and quality, 848
 vitamin-free, for animal experiments, 385.

Dietary habits—

- of girls in high school and college, Kans. 126.
 of racial groups and dental defects, Hawaii 268.
- Diethylstilboestrol, effect on milk secretion, 519.
- Digestive enzymes, basal secretion in old age, 126.
- Dill, photoperiodic induction, effect of environment, 323.
- Dioon edule* shoot apex, zonal structure, 169.
- Diphatia* new genus, erection, 89.
- Diphaulaca*—
cordobae n.sp., description, 89.
meridae n.sp., description, 89.
panamae n.sp., description, 89.
- Diplocarpon earliana*, notes, 77.
- Diplodia*—
 dieback of pines at Canberra, 373.
 dry rot, notes, Iowa 205.
 dry rot, on corn, La. 46.
 spp. host relations, 206.
seae, blotinlike substance produced by, 740.
- Diplodina lycopersici* on tomatoes, 66.
- Diploiaena tricusps* in crows, 82.
- Diprion polytomum*, see Spruce sawfly, European.
- Dirofilaria immitis*, treatment with fudrin and sulfanilamide, 538.
- Disease(s)—
 deficiency, see Diet deficiency diseases and specific disease.
 infection, resistance to, and deficiency diseases, interrelation, 252.
 of animals, see Animal diseases and specific diseases.
 of plants, see Plant diseases and specific host plants.
- Dishes, sanitization, 125.
- Dispharynx spiralis* in partridge, 82.
- Distemper, canine, sulfapyridine in treatment of, 825.
- Distillers' byproducts for poultry rations, 235.
- Distillery residues, dried, as milk substitute for chicks, Wis. 516.
- Ditylenchus dipsaci*—
 on narcissus bulbs, results of treatments, 781.
 survival in New York, U.S.D.A. 768.
- Dodder—
 effect on Korean lespedeza yields, 343.
 transmission of plant viruses by, 630.
- Dog(s)—
 bull terriers, coat color inheritance in, 746.
 feeding and breeding, Mass. 804.
 nutrition, pantothenic acid and factor W requirement, 387.
 principle of tissue autolysis in therapy. 113.
 running fits, Md. 248.
- tick—
 American, characteristics, and geographical distribution, 800.

Dog(s)—Continued.

link—continued.

American, control on dogs, 825.
brown, control on dogs, 825.

Dogwood, flowering, natural layering and underground extension, 354.

Duthiella—

sp., notes, La. 769.

ulmi spores, distribution by sap stream in elm, 781.

Dough, colloidal properties, Kans. 5.

Doughs, plasticity, 582.

Doves—

and their hybrids, differentiation of sera, 179.

mourning, ecology and management, Iowa 217.

species cross in, immunogenetic studies of serum proteins, 746.

Downy mildew infections, sporulation injury associated with, 771.

Drainage, artificial, stream line experiments in artesian basin, 802.

Drinking utensils—

oral contamination, presumptive test for, 269.

sanitary quality, methods for determining, Mass. 724.

Drosophila ampelophila, see Pomace fly.

Drought, rust, or frost injured seed, relative values, 71.

Drug(s)—

action on horses, 528.

situation, botanical, in United States, 451.

Dry land crops at Dalhart, Texas, field station, U.S.D.A. 188.

Dry land pasture experiments, Mont. 473.

Duck(s)—

analysis of sex dimorphism in growth, 179.

breeds of, receiving oestrogens, blood serum and skeletal changes in, 332.

eggs, fatty deposits on shells, effect on hatchability, 97.

eggs, Massey, incubation, relation to temperature and moisture, Hawaii 281.

mallard, domestic, unusual plumage, 36.

studies, Iowa 217.

wild, blood parasites of, 405.

Ducklings—

nutritional myopathy, prevention by α -tocopherol, 255.

vitamin D requirements, 98.

Duty of water, see Irrigation.

Dwarfism, disproportionate in fowl, nature of, 36.

Dyslobus tanneri, apple pest in Northwest, 784.

Dysphagia ascribed to vitamin B complex deficiency, 421.

Earth, rotational properties, effect on weather, 728.

Earwig—

European, bait improvement, Idaho 786.

European, parasites, Mass. 787.

Earwig—Continued.

European, sodium fluoride bait for control, 785.

parasite, successful hibernation, in Ontario, 786.

Easter lily—

bulbs, effect of cool storage on forcing performance, 624.

Creole, flowering and bulb production, 61.

Echinostoma revolutum in partridge and pheasant, 82.

Ecology studies, 316.

Economics and business, statistical methods applied to, 864.

Ectocephala—

genus in North America, 510.

sulcata n.sp., description, 510.

Edema—

in cattle and goats, begari fodder as preventive, N.Mex. 239.

in chicks prevented by vitamin E, Md. 231.

Edestin, substitute for, 270.

Education—

of children in different land classes, Del. 117.

research studies in, bibliography, 555.

Egg(s)—

albumin, see Albumin, egg.

and egg products, uses, marketing, storage, and handling, U.S.D.A. 97.

boron in, Ky. 852.

chemical composition, 691.

cooler, home-made, construction, Hawaii 281.

cooperative marketing, factors affecting future of, Iowa 262.

flavor, effect of salmon meal on, Wash. 516.

fresh and stored, relation between measurements and behavior in cake baking, 846.

gross margins on, Kans. 117.

hatchability, effect of cottonseed oil, 236.

hatchability, relation to total weight and weight of parts, 236.

hatching qualities, 97.

infertile, detection prior to incubation, Ala. 515.

infertile, maintenance of quality, Iowa 231.

Interior quality—

candling as an indication, Md. 231.

effect of frequency of gathering, 808.

effect of fresh cereal grass, 97.

heredity, environment, and storage conditions affecting, Wash. 516.

nutritive value, 691.

pantothenic acid in, effect of diet, 235, 357.

production—see also Hens, laying.

and hatchability, effect of mash level on efficiency of alfalfa leaf meal for, R.I. 806.

Egg(s)—Continued.

production—continued.

artificial light for, duration and intensity, Wash. 542.

products, frozen, quality, effect of *Bacteriokila coli*, Md. 231.

quality, factors affecting, Oreg. 808.

returns from \$100 spent for feed, Iowa 262.

riboflavin-deficient, increased mortality of developing chick embryos in, 603.

size, genes for, transmitting ability in males of, 466.

uniformly rich in vitamin D, production, Iowa 231.

weight, effect of date of hatch, 237.

weight, genetic aspects during inbreeding, 177.

White Leghorn, shell finish in, inheritance, 36.

yolk-color rotors, Heiman-Carver, comparison, 809.

yolk, vitamin A, carotene, and xanthophyll in, 806.

Eggplant(s)—

breeding, R.I. 762.

Phomopsis blight and fruit rot, Fla. 629.

seed germination, effect of fruit rot, 774.

varietal reactions to *Phomopsis rewanis*and *Verticillium* wilt, R.I. 770.

varieties, La. 761.

Eimeria—

alabamensis n.sp., description, 822.*neocatrix* in poultry, sulfur therapy in, 672.*nieschulsi* infection in rat, effect of parenteral administration of vitamins B₁ and B₆, 667.*nieschulsi*, oocyst production, effect on yeast in rations of rat, 641.

spp., oocysts from cattle in Alabama, 822.

subsphectica n.sp., description, 822.*tenella*, effect on glycogen stores of chicken, 826.*tenella*, notes, 540.*zurni* in calves suffering from tropical diarrhea, P.R. 821.*zurni* infection of calves, effect of sulfanilamide, 400.*Elaeis to Eysenhardtia*, check list revision, U.S.D.A. 204.

Electricity for curing and storing sweetpotatoes, S.C. 42.

Electrification, rural, rapid developments in, Idaho 828.

Electrification, rural, studies, 257.

Electrokinetics, 530.

Electron microscope, new tool for bacteriological research, 326.

Element(s)—

85 (ekalodine) and iodine metabolism, comparison, 271.

minor, deficiencies in crops, symptoms and diagnosis, 66.

minor, response of plants to, Ala. 445.

minor, status in Liebig's day and recent developments, 789.

Element(s)—Continued.

minor, studies, West.Wash. 446.

unusual, study of plant materials for, Fla. 589.

Elevators—

cooperative, income from grain in, Iowa 263.

farmers', history, development, and financial stability, Iowa 268.

Elgetol tests on apple scab, 635.

Elm—

bark beetle, smaller European, transmission of Dutch elm disease by, 638.

bark beetles, scouting for, Mass. 787.

Chinese, new fungus disease caused by *Cytospora* on, Colo. 782.

disease, Dutch—

campaign against, progress, 498.

fungus transmission by ambrosia beetle, 793.

in Maryland, U.S.D.A. 628.

insects concerned in dispersal, 789, Mass. 787.

problem, Mass. 769.

susceptibility of American v. exotic species to *Ceratostomella ulmi*, 782.

transmission by bark beetles and development of infection, 638.

diseases, distribution by sap stream of spores of fungi inducing, 781.

moline, chytrid inhabiting xylem in, 216.

trees, tumors on, 498.

wilt and dieback, causes, Mich. 65.

wilt due to *Verticillium*, 78, Mass. 769.*Elainoe randii*, notes, 768.*Elasmus arenarius* disease caused by *Ustilago hypodytes*, 207.

Embryos and ancestors, 464.

Emphysema, alveolar pulmonary, in horse following injection of histamine, syndrome, 538.

Empoasca—

devastans, cotton varieties susceptible to in Punjab, 644.*fabae*, see Potato leafhopper.*maligna*, see Apple leafhopper.

Encephalitis-like symptoms in turkeys, 827.

Encephalomalacia, nutritional, of vitamin E-deficient chicks, cholesterol in brain of, 673.

Encephalomyelitis—

avian, Mass. 815.

equine—

and related affections in United States, history, 537.

eastern type in Massachusetts, 664.

experimental treatment with hyperimmune rabbit serum, 403.

formalized virus, effect of age on rate of immune response of mice to, 254.

in man, 671.

in New Jersey pheasants, 538.

infections, Md. 248.

Moscow 2 virus, relation to rabies, 254.

1938 outbreak, 664.

Encephalomyelitis—Continued.

equine—continued.

relation to mosquitoes, 647.

repeated passage through susceptible laboratory animals, effect, 537.

review of literature, 254.

studies, 824, Kans. 104, N.Dak. 824, Nev. 527.

virus and vaccine, chick-embryo-propagated, antigenicity and preservation, 538.

virus, eastern, effect of age on susceptibility in mice, 824.

virus, eastern type, westward

virus, infection of birds with, 402.

virus, neutralization tests, 671.

spread, 538.

virus protein, eastern strain, molecular stability, effect of pH, 402.

virus, repeated vaccination of man against, 403.

virus, search for carriers of, 824.

virus transmission to western burrowing owl, 403.

virus, western type in wood tick, hereditary transmission, 254.

Encyrtolophus sordidus costalis, false stable-fly in living nymphs of, 88.

Endive yellows disease, [N.Y.] Cornell 72.

Endocarditis in swine, 110.

Endoconidium temulentum on rye, 363.

Endocrine organs, growth in rabbit, 181.

Endogone n.sp., description, 315.

Engineering service, Iowa 257.

Enteritis—

in sheep due to *Globovium gilvuthi*, 535.

necrotic, of pigs—

nicotinic acid test for, Wis. 537.

prevention in young fed massive doses of *Salmonella choleraesuis*, 382.

relation to nutrition, 382, Mich. 670.

nonspecific, of chickens with fowl leucosis, Iowa 247.

ulcerative, in quail and wild fowl, Mo. 256.

Enterohepatitis, infectious, see Blackhead.

Enterotoxemia—

of lambs and kids, Tex. 535.

production of immunity to in lambs, 401.

Entomological science, development in South Africa, 85.

Entomology—see also Insect(s).

economic, pioneer period in South Africa, 85.

Entomospodium maculatum, overwintering in dead leaves of Chinese sand pear, La. 769.

Enzymes, pectic, studies, 561.

Enzymology and related subjects, advances in, 173.

Ephestia—

cautella, see Almond moth.

ciutella, see Tobacco moth.

grullella, see Raisin moth.

kuehnieula, see Flour moth, Mediterranean.

ephestia caudata, notes, 788.

Epilachna varitestrus, see Bean beetle, Mexican.

Epimasty of tomato, early symptom of *Fusarium* wilt, 74.

Epitria—

cucumeris, see Potato flea beetle.

parvula, see Tobacco flea beetle.

Epiurus foliae, biology and immature stages, U.S.D.A. 230.

Equines, reproduction studies, 381.

Eriococcus azaleae, insecticides for control, Ala. 499.

Erosion, see Soil erosion.

Eryoinia—

amylovora growth, relation to nectar concentration, 779.

amylovora isolates, serological study, 32.

carotovora, cause of lettuce rot, Ariz. 628.

carotovora, notes, 494.

vittvora n.comb., notes, 363.

Erysipelothrix—

identification and relation to *Listeria*, 398.

rhusiopathiae—

causing endocarditis in swine, 110.

cultural and biochemic properties, 105.

relative efficiencies of disinfectants for, 105.

Erysiphe—

cichoracearum, notes, 72, 638.

cichoracearum on phlox, Mass. 770.

graminis tritici, biology, new findings on, 359.

Erythrocytes, ability to synthesize factor V from nicotinic acid, 859.

Escherichia—

Aerobacter organisms in ice cream, methods of estimating, Kans. 98.

and *Aerobacter*, differentiation, value of citrate in, 32.

coli added to soil, effect, 18.

coli, effect on quality of frozen egg products, Md. 231.

coli in foxes, lactose-fermenting variants, 819.

coli in milk and ice cream, effect of pasteurization, 658.

coli isolation from nut meats, media for, 156.

Euthiopterum—

macrourae n.sp., description, 790.

passerinae n.sp., description, 790.

Ethyl alcohol, production and oxidation by legume nodules, 317.

Ethyl mercuric bromide—

effect on germination and early growth of wheat, 598.

in talc dust, effect on rooting of stem cuttings, 318.

Eucalyptus—

holocellulose, attempt to isolate fiber-bonding material from, 460.

production in Brazil, 767.

Hucephalobus osyroides causing tobacco root decay, S.C. 66.

Euonymus radicans crown gall, U.S.D.A. 768.

- Euphorbia* smut, new, from Louisiana, 372.
Euribia faceana, egg distribution of chalcid parasites of, 798.
Eurytoma, new species from Mexico, host relations and distribution, 514.
Eutettia tenellus, see Beet leafhopper.
Eumesta stigmatias, notes, P.R. 85.
 Evaporation—
 and climate in Alpine and Arctic zones, 729.
 and transpiration, committee on, 302.
 for 1917-39, monthly measurements, Ariz. 675.
 studies, Fla. 675.
 Evergreens, fertilization, Ohio 765.
 Evergreens, hardness, Mass. 762.
 Evolution, course, by divergent mutation rather than by selection, 461.
 Ewe(s)—see also Sheep.
 anoestrous, production of heat and ovulation in, 750.
 bred to rams of different breeds, effect on lamb and wool production, Miss. 517.
 feeding value of distillers' rye dried grains for, Md. 231.
 genital tract, effects of oestrogen and progesterone, 332.
 mountain, wintering, experiments, 386.
 pregnant, alfalfa-molasses silage v. alfalfa hay for, Ky. 801.
 pregnant, hay-feeding tests, Ky. 801.
 range, blood phosphorus levels, seasonal variation, Idaho 800.
 range, feeding and finishing rations, Nev. 516.
 suckling lambs, value of beet molasses, wet beet pulp, and grains for, Wash. 516.
 western, types for Kentucky, Ky. 747.
 Exanthema, vesicular, of swine, Calif. 104.
Exenterus tsugae, parasite of hemlock sawfly, 230.
Esopopus, new nearctic species, 510.
 Experiment—
 Farm, Mesa, nature and results of work, Ariz. 286.
 farms, State, practical results from, Wyo. 143.
 station(s)—see also specific stations.
 bulletins, extent read by those receiving them, Mich. 120.
 data, statistical studies, Iowa 263.
 in 1940, editorial, 145.
 organization list, U.S.D.A. 690.
 report, U.S.D.A. 286.
 research work, results received by farmers, Miss. 430.
 Experiment Station Record, minor change in procedure, editorial, 579.
 Extension—
 Service work with low-income farmers, W.Va. 689.
 work, cooperative, report, U.S.D.A. 267.
 work, effectiveness, Mich. 120.
 Eye gnats—
 new species, descriptions, 88.
 gnats—continued.
 studies in Southeast, 797.
 Eye worms of sheep, Calif. 104.
 Eyes, pathological conditions, relation to nutrition, 694.
 Fabrics—see also Textile(s).
 and yarns, compressional creep and creep recovery, 430.
 draping properties, instrument for measuring, 142.
 mildew-resistant treatments, 283.
 resistance to moths, testing, 377.
 viscose, acetate, and cuprammonium, effect of light and heat on, 862.
 Factor(s)—
 B₂ and B₆ in vitamin B complex, 704.
 V synthesis from nicotinic acid by erythrocytes, 859.
 Z in hybrid corn, 320.
 Z₁ and Z₂ in solutions of unknown composition, estimating, 320.
 Factory payrolls and prices received by farmers for beef cattle, Okla. 677.
 Fagaceae, comparative embryology, 169.
Fagopyrum emarginatum, taxonomy, 315.
Fagus, species problem in, 170.
Fagus to *Franseria*, check list revision, U.S.D.A. 204.
 Fallow preparation to double yields with moldboard plow, Wyo. 115.
 Fallowing, summer, value and use, Kans. 753.
 Family(ies)—see also Farm family(ies).
 expenditures for housing and household operation, urban and village, U.S.D.A. 862.
 living costs of Farm Security Administration clients in 1939, Ariz. 676.
 living studies, Hawaii 268.
 low-income rural, needed research among, W.Va. 689.
 relocation from basin of Wappapello Dam, Mo. 689.
 rural, and social adjustment of members, Iowa 265.
 social work in rural areas and public welfare, 843.
 Vermont village, housing, Vt. 143.
 Farm(s)—
 adjustments to meet war impacts, 548.
 animals, see Livestock and Animals.
 building(s)—
 foundations for, U.S.D.A. 547.
 losses due to wind and fire, Iowa 257.
 plans, preparation of, Idaho 828.
 research, 257.
 credit, see Agricultural credit.
 crops, protection from insect damage, Miss. 430.
 distribution by size groups, Okla. 830.
 electricity on, see Electricity.
 equipment, efficiency in use, Mich. 115.
 expense, size of business, and income, changes in, S.C. 118.
 family(ies)—see also Family(ies).
 food consumption, S.C. 125.
 incomes and expenditures, Iowa 284.

Farm(s)—Continued.

family (ies)—continued.

living, adjusting to war and home defense, U.S.D.A. 143.

living expenses, Colo. 863.

low-income, Government aid for, Minn. 717.

of Vermont, housing, Vt. 863.

fish ponds, Ala. 499.

Forestry Act, Cooperative, intensive projects under, U.S.D.A. 203.

freezing units, design, 545.

growing starch sweetpotatoes and general, factors for success on, Miss. 550.

growing starch sweetpotatoes, labor income and net profit, Miss. 410.

in different areas, earnings, size of business, and efficiency factors, Idaho 829.

in Inner Bluegrass area, sources of income and most profitable enterprises, Ky. 829.

in Pennyroyal Plain area, sources of income and earnings, Ky. 829.

income and stability of farm plans, Okla. 830.

income data, Iowa 262.

income, expenses, depreciation, etc., Idaho 829.

income, factors affecting, Kans. 117.

income, gross, from crops, livestock, and Government payments, N.Dak. 117.

income in Mississippi, Miss. 552.

irrigated, relative labor incomes of owners and tenants, Wyo. 118.

land, abandoned, v. virgin land, grazing capacity, Wyo. 43.

land use, crops, and livestock on, Okla. 830.

low-income, conference on, W.Va. 689.

machinery, see Agricultural machinery.

management analysis of farms under agreement with Soil Conservation Service, S.C. 678.

management, efficient, lowering costs, 523.

management for soil conservation, W.Va. 831.

management, publications dealing with, U.S.D.A. 678.

minimum sized, planning for Hyde County area, S.Dak. 550.

mortgage loans, studies, Del. 117.

motor trucks, cost of operation, [N.Y.] Cornell 260.

operator's net earnings, Ky. 829.

partnership, characteristics, N.Dak. 535.

population decrease in State, Colo. 555.

population of Iowa, changes in, Iowa 265.

power and equipment, cost, [N.Y.] Cornell 407.

power and machinery, 257.

practices recommended, survey of compliance, N.C. 41.

prices of North Dakota, N.Dak. 286, 839.

products, see Agricultural products.

residues, utilization, 544.

Farm(s)—Continued.

Security Administration—

clients, cost of family living, Ariz. 678.

income and expenses compared with other farms, Mich. 119.

work with low-income farmers, W.Va. 689.

Security farms, horse and mule program on, 381.

small, percentages of gross income used for expenses and interest, Ky. 829.

taxation, see Taxes.

tenancy—see also Land tenure.

favorable aspects, Tenn. 410.

in Georgia, graphic summary, Ga. 552.

Farmer(s)—

age, time employed off their farms, experience, etc., Del. 117.

American, and World War and hemisphere trade, U.S.D.A. 119.

cooperation in northern Alabama, Ala. 552.

income, importance of changes in demand and quantity, 676.

number cooperating in 1939 A. A. A. program, and effects, Iowa 262.

Farming—see also Agriculture.

conservation, better harvests through, U.S.D.A. 591.

contour, saving soil with, 448.

dairy, see Dairy farms.

dry-land, see Dry land.

general crop and livestock, labor income of, Wyo. 118.

part-time, in rural-industrial area, La. 842.

profitability, relation to wheat acreage and numbers of livestock, Okla. 830.

types, areas, map of, U.S.D.A. 683.

types in main areas, Okla. 830.

Fasciola gigantica, control in Hawaii, 535.

Fat(s)—see also Oil(s).

and oils for cooking and table use, U.S.D.A. 122.

deficient diet, changes in kidneys of rats showing hematuria on, Ala. 566.

globules, staining with Nile blue sulfate, 238.

in eggs and chickens, composition and quality, effect of rations, Ky. 801.

in presence of free fatty acids, determination, 158.

intake and output of hens on low fat and normal ration, 805.

metabolism and susceptibility to carbon tetrachloride, 819.

natural, comparative rate of absorption, 559.

Fatty acids—

insecticidal properties, 787.

saturated, determination, 158.

unsaturated, effect on use of carotene, Ala. 564.

Feather—

color pattern produced by grafting melanophores during embryonic development, 329.

morphogenesis of, 603.

physiology of development, experimental morphogenesis, 467.

Fecal analysis of red fox, methods and computation in, 826.

Federal programs, effectiveness of, Kans. 117.

Federal Surplus Commodities Corporation, report, U.S.D.A. 687.

Feeding experiments—see also Cow(s), Pig(s), etc.

and nutritional work, 382.

Feeding stuffs—

basic, seasonal variation and economy, Mo. 688.

carotene in, 8, S.C. 98.

composition, digestibility, and digestible nutrients for rabbits, 234.

conversion to food for man, efficiency of farm animals in, 652.

home-produced, importance, 239.

inspection and analyses, Ariz. 232, Conn. [New Haven] 652.

South African, carotene in, 801.

storage, 239.

surplus, sold and fed to livestock, effect on farm income and expenses, Idaho 829.

value, relation to changes in processing, 382.

vitamin E in, Iowa 231.

Fence—

construction, farm, Iowa 257.

electric, controllers, equipment developed for measuring characteristics, 409.

Fencing—

and wire, atmospheric exposure tests of, Iowa 257.

electric, tests, Pa. 262.

Fenugreek seed oil, 294.

Fermentation, industrial, stability of a culture for, 32.

Fern control experiments, Wash. 471.

Fern rusts of *Adiantum* in Japan, cultural experiments, 79.

Fertility, maintenance, foundation of successful agriculture, 165.

Fertilizer(s)—

acidulated, development by use of small amount of sulfur, Ariz. 589.

analyses and law, Mont. 168.

as supplement to manures and rotations, Idaho 729.

control office, Arizona, report, Ariz. 168.

effect on pasture herbage and botanical composition, Va. 611.

effect on yields and soil composition, Kans. 18.

for New Jersey crops, N.J. 22.

for Utah soils, Utah 592.

guarantee tag on, Miss. 450.

inspection and analyses, N.H. 23, R.I. 314.

Fertilizer(s)— Continued.

magnesium and manganese in, 6.

methods of application, N.Y. State 735.

mixtures, cooperative field experiments with, Wash. 23.

needed in Utah, advice to farmers concerning, Utah 168.

nitrogenous, see Nitrogenous fertilizer.

placement machinery for southern crops, 739.

placement program, reports of regional committees on, 592.

placement under irrigation, 312.

recommendations for use on farms, Miss. 312.

requirements, soil and plant-tissue tests for, 735.

retention by soil against leaching, Del. 13.

sources and available supplies, U.S.D.A. 22.

tests, see special crops.

treatments, crop responses to and financial returns, [N.Y.] Cornell 609, 610.

Fescue, meadow, strain tests, Mass. 752.

Fever therapy for treatment of trichomoniasis in turkeys, 255.

Ficivir caricae, proposed name for fig mosaic, 497.

Field experiments, partial elimination of experimental error by significance tests, 48.

Field plats, automatic watering, 451.

Fig(s)—

boron in, Ky. 852.

characteristics for identification of varieties, Calif. 765.

composition and energy value, 691.

leaf spot, new, 768.

mosaic, 497.

tree borer, bionomics and control, 645.

Filberts, storage, U.S.D.A. 411.

Fingergrass, woolly, seed production, Ariz. 608.

Fir, Douglas—

cycle from, to hemlock, 202.

growth in eastern Idaho, 767.

ring growth, 588.

specific gravity and strength, effect of heart rot fungi, U.S.D.A. 639.

Fire(s)—

forest, see Forest fire.

insurance companies, farmers' mutual, in North Carolina, N.C. 553.

insurance, farm, costs in State, Md. 263.

protection of timberlands, financing under Oregon laws, Oreg. 487.

Firebrat, methyl bromide tests against, 220.

Fireworm—

black-headed, on cranberry, 643, Mass. 786.

hill, on cranberry, 643, Mass. 786.

sprays, dormant sprays for, Wash. 503.

Fish(es)—

available iron in, 128.

crosses, interaction of hereditary factors, 746.

Fish(es)—Continued.

- muscle, progressive decomposition, Mass. 724.
- of Iowa, survey, Iowa 217.
- ponds, farm, Ala. 499.
- ponds, stocking experiments, 499.
- refuse for pigs, value, 517.
- valuable forage, of North Dakota, N.Dak. 83.

Flatheaded borers in pine in California, 227.

Flavin in liver, effect of muscular work, 420.

Flavor, definition of, 126, 849.

Flavoring baked goods by absorption, Calif. 126.

Flax—

- anthracnose in California, U.S.D.A. 351.
- breeding, Kans. 40.
- cropping, N.Dak. 757.
- culture experiments, Ariz. 181, Calif. 40, Kans. 40.
- harvesters, rubber-roller, Calif. 115.
- leaf rust, in North Dakota, N.Dak. 771.
- production tests, N.Mex. 753.
- Punjab, date-of-seeding and fertilizer test, Ariz. 608.
- rust, breeding for resistance to, N.Dak. 774.
- seedling blight, prevention, 493.
- variety tests, Ariz. 181, Iowa 182, Kans. 40, Wash. 471, Wis. 471.
- Viking, description, N.Dak. 186.

Fleas—

- as carriers of sylvatic plague, Calif. 104.
- infesting wild hares and rabbits, key, 648.

Flea beetle(s)—

- injurious to beans in tropical America, 89.
- pale-striped, description and control, Ga. 792.

Flesh fly fatal to kit mink, 502.

Flood- and power-warning, quantitative forecast system for, 159.

Floor finishes, kinds and maintenance, R.I. 864.

Flora(s)—see also Plant(s) and Vegetation.

- local, of United States, 170.
- local, relation to conservation, 170.
- of Cuba, Gymnospermae, U.S.D.A. 23.
- of Nevada, Gramineae, U.S.D.A. 171.
- of Oregon, 315.
- of Ruthven area in Iowa, 170.
- of Whatcom County, Washington, 23.
- upland and coastal, of Eastern United States, and theory of floral radiation, parallelism in, 170.

Florida Station, notes, 865.

Florida Station, report, 717.

Florida University, notes, 865.

Floor beetle—

- confused, seasonal variation in resistance to high temperature, 499.
- nutritional requirements, 379.

Floor moth, Mediterranean, pupation at low temperature, 225.

Flour—see also Bread.

- proposed enrichment with vitamins and minerals, 181.
- quality, factors affecting, Kans. 5.
- quantity and quality, tempering factors, Kans. 41.
- test baking, usefulness of motor-driven sheeter in, Minn. 532.
- wheat, tempering factors affecting quantity and quality, Kans. 5.
- white, with vitamin B₁ added, v. whole-wheat flour, nutritive value, 567.
- whole-wheat, superiority of, 567.

Flower(s)—see also Plants, flowering, and Plants, ornamental.

- annual, growth and flowering, effect of temperature and photoperiod, 60.
- annual, tests, Pa. 60.
- buds and classification, 170.
- diseases, 78, Calif. 65.
- nector of Labiatae, ascorbic acid in, 424.
- seeds, packaged, testing, Mass. 762.
- thrips, Florida, studies, Fla. 641, 642.
- use of cloth houses for, Kans. 48.

Flowmeter for respiration studies, diagram and construction, 28.

Fluke infection, estimation by egg counts, Hawaii 247.

Fluorine—

- adsorption by enamel, dentin, bone, and hydroxyapatite, 562.
- as cause of mottled enamel on teeth, 129.
- content of Chinese foods, 418.
- mottled enamel, and dental caries, 419.
- role in phosphate availability, Tenn. 593.
- studies, Ariz. 694.

Fluorosed enamel and dentine, solubility, 419.

Fluorosis, endemic, and dental caries, 129.

Fly(ies)—

- house, see Housefly.
- repellent, effective, phenoxychloroethyl ether as, Wis. 503.
- sprays, effect of terpene ether on, 510.
- strike, control, Calif. 83.
- strike in Merino sheep, 109.

Fodder crops, see Forage crops.

Fomes—

- hartigii* on silver fir, histopathological study, 81.
- ignarius* v. *lactigatus* on birch, 638.
- pini*, effect on specific gravity and strength of conifers, U.S.D.A. 639.
- polypores, taxonomic study, 358.
- robustus* on durmast oak, histopathological study, 81.

Food(s)—see also Diet(s).

- absorption of fluorine by, from cooking water, Ariz. 694.
- aggridant, requirements for production, Me. 691.
- and Drug Administration, report, U.S.D.A. 411.
- baked, flavoring by absorption, Calif. 126.
- carotene in, 8.
- Chinese, fluorine contents, 418.

Food(s)—Continued.

consumption—

family, and dietary levels, U.S.D.A. 270.

family, content, cost, and nutritional adequacy, U.S.D.A. 270.

of farm families, S.C. 125.

studies in Puerto Rico, P.R. 848, 849.

control and agricultural control in Switzerland, U.S.D.A. 679.

fluorides in, 120.

for family consumption, home production, Miss. 575, Tenn. 575.

frosted, merchandising and packing, 155.

frozen—

California conference, papers, 155.

industry, Tenn. 551.

keeping quality, 124.

pack, securing high-quality raw materials, 155.

quality in, measurement, 155.

wrapping materials used on, moisture vapor proofness, 155.

glass-packed, vitamin C and A retention in, 853.

habits in United States, 269.

industries, new group of sterilizing agents, 524.

industry, paper and paperboard used in, microbiology, 693.

introductory, 267.

judges, prospective, sensitiveness to primary tastes, 850.

locker plant industry of Wisconsin, regulation, 119.

mixers, small electric, operating efficiency, Iowa, 285.

nicotinic acid in, estimation, 858.

of Ceylon, analysis, 570.

packaged, purchased in retail markets, ascorbic acid in, 134.

packaging, microbiological content, 558.

plants, absorption of chemical elements important in human nutrition, Mass. 729.

products, imported perishable, methyl bromide fumigation, U.S.D.A. 501.

products, liquid, iron determination in, 6.

protection against insects, transparent films for, tests, Wis. 503.

quick frozen, reasons for quality control, 299.

rationing in United Kingdom, U.S.D.A. 119.

refrigerated, development of *Olistridium botulinum* in, 124.

specified, purchases and consumption in three Alabama towns, Ala. 575.

spoilage micro-organisms, action of acetic acid on, 156.

suitable for freezing preservation, Ga. 698.

textbook for college course, 121.

vitamin B₆ in, chemical estimation, 441.

Forage(s)—

crop diseases, Kans. 65.

Forage(s)—Continued.

crop seed, plant production value, Md. 182.

crops, mixtures, variety tests, Wash. 471.

crops, variety tests, Kans. 40, N.Mex. 183, Wyo. 43.

grasses, *see* Grass(es).

methods of preserving by ensiling, 651.

nursery and plant adaptation studies, Fla. 609.

plants of Utah, selenium in, 232.

poisoning. *see* Plants, poisonous, and specific plants.

production from soybean varieties, N.H. 47.

range, carotene, Ca, and P analyses of, Ariz. 651.

yields, N.Dak. 42.

Forbs, range reseeding trials with, N.Mex. 613.

Foreign Agriculture, new format and editorial policy for, U.S.D.A. 119.

Forest(s)—

and watershed fires, Utah 204.

climax, historical development in western North America, 170.

fire control notes, U.S.D.A. 627.

fire control, planning basis for, U.S.D.A. 64.

fire control technic, U.S.D.A. 204.

fire danger, effect of altitude and aspect on daily variations in factors, U.S.D.A. 63.

frontiers, new, for improvement of Nation, U.S.D.A. 624.

influence on mountain watersheds, Calif. 115.

insect(s)—

control, effectiveness of concentrated sprays in, U.S.D.A. 501.

damage in Canada, gross estimate, 786.

injury, classification, 785.

of Quebec, 86.

survey, Minn. 644.

survey, Canadian, 785.

management and slash disposal after clear cutting in Douglas-fir region, U.S.D.A. 203.

management for cut-over hardwood lands, W.Va. 625.

news of Ohio, Ohio 767.

nursery soils, effect of nonlegume growth on, 738.

resources of south Georgia and future outlook, U.S.D.A. 62.

seedlings, nutrition, role of mycorrhiza in, Wis. 485.

soil, effect of stand composition on nitrogen transformation in, 309.

species, transpiration rates, Calif. 62.

studies of Logan Grove, Kansas, 624.

trees, *see* Tree(s).

virgin, perpetuation, role of fire in, 486.

Forestry nursery trees for farmers at low cost, Utah 202.

- Forficula auricularia*, see Earwig, European.
- Foulbrood, American—
behavior of bees toward brood infected with, 798.
susceptibility of bee larvae to, 91.
variation in resistance to, Iowa 218.
- 4-H Club(s)—
forestry for, U.S.D.A. 690.
girls attending camp, nutritional status and dietary habits, Fla. 691.
- Fowl(s)—see also Chicken(s), Hen(s), Poultry, etc.
fertilizing ability, effect of period of illumination, Ala. 515.
genetics of, 748.
genetics of, sex-linked, imperfect albinism in, 329.
hypophysectomy, operative technic for, Iowa 176.
importance of light in sexual development, 179.
paralysis, see Paralysis.
pox, studies, West.Wash. 539.
pox vaccination of day-old chicks, Hawaii 247.
pox vaccine, development, Calif. 104.
pox virus, chorioallantoic and comb-tissue, longevity in vitro, 540.
sex ratio in, 329.
thyroidectomized, gonads in, sex differences in activity, 335.
typhoid, breeding for resistance to, Iowa 247.
wild, ulcerative enteritis in, Mo. 256.
- Fox(es)—
blood chemistry of, 539.
northern plains red, feeding by turkey vultures at dens of, 500.
parasites and diseases, Iowa 217.
pups, rickets in, 404.
pups, silver, value, factors affecting, 639.
red, ecology and management, Iowa 217.
red, estimating population, 374.
silver, anti-gray hair vitamin deficiency in, 276.
vitamin A studies with, 384.
vitamin B₁ deficiency disease produced by feeding fish, 672.
- Frankliniella—
cephalica bipinnosa, studies, Fla. 641.
fusca, see Tobacco thrips.
raccinii, notes, Me. 642.
- Fraxinus* to *Gleditsia*, host-parasite checklist revision, U.S.D.A. 357.
- Freemartin condition, early recognition in heifers twinborn with bulls, 39.
- Freeze, Midwest armistice day, aftermath of, U.S.D.A. 357.
- Freeze of 1940, forecasts and warnings of, Fla. 588.
- Freezias, culture, Mass. 762.
- Freezing—
locker plants, directions for laying out, Ga. 693.
units, farm, design, 545.
- Fright disease and thiamin deficiency, 671.
- Frost(s)—
action in highway bases and subgrades, 258.
in August, damage, Conn.[New Haven] 729.
injury to apple foliage in fall, 482.
penetration, deep, effect of grazing, Wis. 446.
resistance, relation to physical state of protoplasm, 27.
rust, or drought injured seed, relative values, 71.
spring, possible effective control, 12.
- Fruit(s)—see also Orchard(s), Apple(s).
Peach(es), etc.
acid canned, spoilage, *Clostridium pasteurianum* in, 155.
and vegetable market, Knoxville wholesale, supply aspects and facilities, Tenn. 685.
and vegetable market, St. Louis wholesale, organization and costs, Mo. 835.
antiscorbic values, 570.
ascorbic acid in, 424.
bramble, training, Kans. 48.
bush, growing in Kansas, Kans. 622.
byproducts work, Wash. 444.
carbohydrate values, 152.
carotene analysis as basis for vitamin A value, 854.
circumeter, description, 62.
citrus, see Citrus.
delayed foliation, effect of hormones, Calif. 52.
- diseases—
in Idaho, U.S.D.A. 357.
in 1939, 214.
on New York market, U.S.D.A. 768.
studies, 635, Kans. 65.
summary, 365.
- drop and color, effect of hormones, chemicals, and vitamins, 481.
dropping, nature and effect of curculio injury on, Del. 47.
fertilization, Calif. 52.
forest, chemical composition, 724.
freezing preservation, Iowa 190.
freezing, procedure and varieties, Colo 847, N.Y.State 847.
fresh, marketing, Calif. 117.
fresh, trade between United States and Canada, effects of trade agreements, U.S.D.A. 840.
frozen, high quality, manufacturing and distributing, precautions in, 155.
frozen Utah, use in ice cream, 238.
garden, home, on northern Great Plains, U.S.D.A. 194.
heat of respiration, calorimetric measurements, U.S.D.A. 546.
industries, effects of war, Calif. 681.
industry of State, merchandising practices, Mass. 880.
insects, control with parasites, 505.
insects in Portuguese East Afr'ca, 85.
insects, problems, 375, 376.

Fruit(s)—Continued.

- insects, studies, 768, Kans. 84.
- introductions, tests, Fla. 619.
- juices—
 - and sirups, blended, preparation and marketing, 301.
 - concentration, Mass. 724.
 - cooperative research, 154.
 - effect on gastric function, 850.
 - quality, factors affecting, Fla. 619.
 - studies, Calif. 5.
- marketing through cooperative canning associations, Oreg. 553.
- moth, oriental—
 - control, U.S.D.A. 505.
 - control, importance and use of parasites, 88.
 - in Missouri, Mo. 508.
 - parasites, Mass. 786.
 - parasites in peach orchards, 514.
 - parasitism in Delaware, ten-year record, 514.
 - relation to parasites, Del. 84.
 - studies, 375, S.C. 84.
- New Mexico, marketing opportunities in Texas, N.Mex. 268.
- nutrient deficiency symptoms in, 357.
- of Ceylon, vitamin C in, 570.
- parthenocarpic and normal, percentage of setting and size, 349.
- phenological studies, N.Mex. 191.
- pigmented, ascorbic acid in, 134.
- plants, damage by November 1940 cold, 635.
- prices and receipts, on Terre Haute producers market, Ind. 836.
- production, principles and practices, 490.
- seedling, water culture experiments on molybdenum and copper deficiencies, 778.
- set, factors affecting, Wash. 477.
- situation and outlook for, Calif. 682.
- size, relation to loss of weight in storage, 481.
- small, disease control situation, 368.
- small, diseases in Britain, 778.
- small, diseases, notes, 365.
- small, diseases, revamped spray schedules for, N.Y.State 215.
- small, freezing preservation, Kans. 48.
- small, frost damage, U.S.D.A. 357.
- small, production, relation to orchard soil toxicity, Wash. 477.
- small, tests, N.Mex. 191.
- sprayed with lead arsenate, effect on consumers, 642.
- spraying, practical aspects, 206.
- statistics, Calif. 688.
- stone—
 - brown rot, in western Washington, 779.
 - brown rot, soil application of calcium cyanamide for, West.Wash. 488.
 - brown rot, sprays for, 215, Calif. 65.
 - diseases of, 365, Wash. 487.

Fruit(s)—Continued.

- stone—continued.
 - rots, *Fusarium* spp. causing, 76.
 - virus diseases, Calif. 65.
 - zinc for, 215.
 - storage, Wash. 477.
 - storage and preservation, Fla. 619.
 - subtropical, rooting, effect of synthetic growth substances, 197.
 - sulfuring for drying, Calif. 5.
 - tests, Fla. 619.
 - thinning, advantages and methods, Miss. 481.
 - tree(s)—
 - buds, rest breaking action of yeast. effect of glutathione, 350.
 - cost of removing, Ohio 481.
 - cultural and fertilizer requirements, Mass. 762.
 - diseases in Britain, 778.
 - immunity to fungus diseases, relation to origin, 75.
 - leaf roller, Wis. 503.
 - magnesium deficiency, 350.
 - orchard mites affecting, Wash. 503.
 - response to irrigation, Wash. 477.
 - rootstocks, nematode resistant, 214.
 - stocks in nurseries, diseases of, Iowa 205.
 - winter injury, relation to low soil temperatures, Wash. 477.
 - tropical, transpiration during ripening, 597.
 - utilization, past, present, and future, 154.
 - vapor heat treatment, Hawaii 190.
 - varieties, Mass. 782, Tenn. 477, Wash. 477.
 - varieties and new seedlings, adaptation, Md. 190.
 - varieties, tree characters of, Mass. 762.
 - variety tests, Kans. 48, Miss. 344, 345, West.Wash. 479.
 - waxing, Calif. 52.
- Fruity(ies)—
- bibliography of, 89.
 - Mexican, yellow chapote, a native host. U.S.D.A. 648.
 - Queensland, control, caged tree tests, 798.
 - West Indian, insects parasitic on, introduction and colonization in Puerto Rico, P.R. 798.
- Fruitworm(s)—
- dormant sprays for, Wash. 503.
 - green, studies, Iowa 218.
- Fumigant(s)—
- and oil sprays, comparison, Calif. 83.
 - greenhouse, studies, Mass. 787.
 - new, 787.
 - testing, laboratory method, 220.
- Funaria hygrometrica*, spore longevity in, 169.
- Fungi—
- advances in science and applications of, 628.
 - air-borne, survey, 84.
 - associated with pecky rice, La. 772.
 - associated with stain in chemically treated green lumber, 81.

Fungi—Continued.

- causing decay of pears, 75.
- cultures, central bureau for, 66.
- diploid cell in, 746.
- diseases of trees, Mass. 769.
- edible and poisonous, 845.
- from Atlantic islands and Portuguese colonies, 66.
- growth rates, determination, photoelectric method, 206.
- metabolism, relation to respiration of citrus fruits, 744.
- notes and descriptions, 315.
- of Florida, 171.
- on diseased cotton seedlings and bolls, 768.
- parasitic and saprobic, of southern Ohio, U.S.D.A. 204.
- previously unreported from Missouri, U.S.D.A. 357.
- spores surviving irradiation, growth, effect of monochromatic ultraviolet radiation, 30.
- superficial, studies by impression method,

- thermal death point, relation to growing conditions, 66.
- toxicity of industrial gases to, 456.
- wood-destroying, physiology of, 498.

Fungicidal ingredients, density and flowability, Ohio 489.

Fungicides—see also Sprays and specific kinds.

- adherence properties, 208.
- analyses, Me. 479.
- copper, see Copper.
- dosage mortality curve for, determination, 64.
- eradicator, for combating apple scab, 75.
- inspection and analyses, N.J. 191.
- protective, 206.
- vapor-spraying equipment for, U.S.D.A. 261.

Fur animal production, need for research in, 374.

Fur fibers, surface structure, method for revealing, 639.

Furniture, slip covers for, U.S.D.A. 285.

Fusarium—

- avenaceum*, growth and biotin, 740.
- bulbigenum lycopersici*, epinasty an early symptom of infection in tomato, 74.
- culmorum* seedling blight of wheat, and soil conditions, 208.
- culmorum*, virulence of artificial inoculum of, 364.
- disease, new, of coffee, 215.
- genus in Argentina, 66.
- genus, study, personal element and light as factors, 358.
- lycopersici*, notes, Fla. 629.
- niveum* wilt of watermelon, Fla. 629.
- oxy-sporum cubense*, effect of sodium nitrate, 490.
- oxy-sporum cubense* on banana, 497.
- perniciosum*, further distribution, U.S. D.A. 628.
- perniciosum*, notes, 638.

Fusarium—Continued.

- solanii maritii* on American holly, N.J. 782.
- spp. associated with root rots, U.S.D.A. 204.
- spp. causing rots of stone fruit, 76.
- spp., physiology of, respiratory and fermentative mechanisms, 596.
- casinfectum*—
 - isolates, pathogenicity tests, 768.
 - notes, S.C. 65.
 - symptoms and control in Brazil, 71.
- wilt of carnation, R.I. 770.
- wilt of cotton, regional studies, 768.
- wilt of potato, varietal susceptibility, 775.
- wilt of tomato, development of resistant hybrids to, U.S.D.A. 74.
- wilt, study, solution-culture infection method for, 490.

Fusoporia polypores, taxonomic study, 358.

Fuzzy cheat, production tests, Tenn. 470.

Galactose, cataractogenic action—effect of amino acids, Mass. 845.

effect of hydrolytic products of casein, 273.

Gall midges affecting grass seed production, 647.

Gambusia holbrooki minnows for control of *Aedes aegypti*, 797.

Gapeworms in poultry, control, U.S.D.A. 114.

Garbage tankage, fertilizing value, Ohio 450.

Garbanzos, inoculation tests and new method for handling and distributing cultures of bacteria, Calif. 40.

Gardenia(s)—

- beetle, Asiatic, susceptibility to infection by type A milky disease, 512.
- farm, irrigation, Kans. 48.
- farm, value of irrigation water for, Wyo. 48.
- home, preparation, planting, and cultural care, Ga. 762.
- pests, insecticides for, Miss. 502.

Gardenia(s)—

- Botrytis* spotting, Calif. 65.
- bud abscission, Wash. 477.
- dormancy and disease in, Mass. 769.
- nutrition, Mass. 762.

Garlic rust infection of onion, U.S.D.A. 204.

Garment plants of Mississippi, type of women employed in, 266.

Gas and vapor movements through porous solids, 15.

Gastric—

- emptying time after ingestion of bile preparation, 271.
- function, effect of fruit juices, 850.
- ulcers in rat, dietary factors in, Iowa 268.

Gastritis, parasitic, in sheep, tests with phenothiazine and copper-nicotine mixture, 669.

Gastrophilus eggs, removal from horse hair, 217.

Gelatin behavior, effect of antioxidants on, Mass. 810.

Genes—

- effect of X-ray irradiation, Iowa 205.
- in *Datura* inducing morphological effects resembling those due to environment, 740.
- more or less lethal, 747.

Genetics Society of America, meetings, papers, 746.

Geography, economic, principles of, 844.

Georgia Station, notes, 287, 576, 865.

Georgia University, notes, 287.

Glits, bred, alfalfa meal v. sweetclover meal for, Wash. 516.

Girls—

- adolescent, attitude toward punishment, 267.
- adolescent, dislikes regarding parental behavior, 267.
- growth factors in, 414.
- high school and college, dietary habits, Kans. 126.
- rural, industries dependent on training, Miss. 430.

Gizzard lining of chicks, erosions, effect of bile acids, vitamin K, and cinchophen, 255.

Gladiolus—

- Botrytis* core rot, 638.
- corms, core rot, 370.
- diseases, Fla. 629.
- diseases and insects, U.S.D.A. 638.
- genus, cytogenetics of, Md. 190.
- hybrids, chromosome number in, 176.
- mosaic studies, 370.
- smut disease, causal organism, 638.
- thrips in Florida, Fla. 644.
- thrips, studies, Fla. 641, 642.

Glanders—

- in horses, histological changes in submaxillary lymph nodes, 528.
- lesions, relation to mallein reaction in Mongolian horses, 528.

Glass container research, Mass. 724.

Glucization, calcium saturation and anaerobic bacteria as factors in, 163.

Gilricidia to *Hymenoclea*, host-parasite checklist revision, U.S.D.A. 357.

Globidium gilvuthi infection of sheep, 535.

Gloeosporium—

- lagenarium* on pumpkins, 66.
- thumensis tulipae* n.f., notes, 371.

Glomerella—

- cingulata*, notes, 365.
- cingulata*, role in canker and dieback of brambles, Idaho 769.

gossypii, spread and survival, S.C. 65.

Gloxinia boron-deficiency disease and control, 215.

Glutathione and rest period of buds, 350.

Glycerol fermentation by *Aerobacter*, trimethylene glycol from, 7.

Glycine, failure to improve growth of excised tomato roots, 318.

Glycine requirements by chicks, 389, 804.

Glypta rufescutellaris, notes, 514.

Goat(s)—

- breeding cycles in, experimental modification, 605.

Goat(s)—Continued.

dairy, effect of avitaminosis E, 394.

dairy, effect of thyroxine on lactogenic hormone in urine, 519.

dairy, improvement, N.Mex. 239.

quintuplet-bearing, progeny of, 35.

skin temperature under winter conditions, 385.

tissue, ascorbic acid of, 234.

warble fly, bionomics, 58.

Golfers, blood sugar studies, on, 126.

Gonadotropic assay on intact immature rat, validity of results, 179.

Gonadotropin(s)—

male urine, effect on spermatogenesis in hypophysectomized immature rats, 603.

pituitary, effect on testicles of hypophysectomized immature rats, 603.

response of testes of immature pigeons to, 605.

Goniorrhadiella highlei, distribution and association with *Nectria coccinea* in United States, 372.

Gooseberry(ies)—

ascorbic acid in, 424.

bushes, magnesium deficiency, 350.

Grain(s)—see also Cereal(s) and Oats, Bye, Wheat, etc.

bin, sectional wood, construction, 547.

disease damage in, 360.

dryer, large portable, Md. 257.

elevators, farmers', business policies, Ill. 686.

exports from Soviet Union, U.S.D.A. 679.

farm prices, index numbers, Fla. 677.

farm-stored, insect infestation, 499.

in elevator storage, insect pests, U.S.D.A. 789.

prices and futures market, 1923-38, U.S.D.A. 839.

ration of cows, fat content, relation to milk and butterfat production, 519.

selenized, effect on growth rate in chicks, 390.

small, condition in Kansas, U.S.D.A. 768.

small, deficiency symptoms, 356.

small, diseases in South Carolina, correction, U.S.D.A. 768.

smuts, control, 69.

storage insect problem, N.Dak. 219.

stored, insect pests, 378.

surplus, feeding tests for, Miss. 348.

Grain(s) from seed of different sources, growth, variations in, 336.

Grain, Rothrock, range reseeding trials with, N.Mex. 613.

Gramicidin—

action on streptococci of mastitis, 250, 251.

suspended in mineral oil, effect on streptococci of mastitis, 251.

use of term, 249.

Gramineae, cytological and systematic studies, 30.

Grape(s)—

Alexandria (Muscat), raisining in transit, U.S.D.A. 57.

Grape(s)—Continued.

- anomaly on cranberry, 643, Mass. 786.
- ascorbic acid in, 424.
- berry moth, control, 225, Mich. 84.
- berry moth, evidence for third brood in Great Lakes region, 795.
- black rot, spraying for, Mo. 215.
- boron deficiency in, S.C. 48.
- breeding, Calif. 52, N.Dak. 52.
- bud beetle, control, Calif. 58.
- cane borer, biology and control, Mass. 787.
- chlorosis, *see* Chlorosis.
- colaspis injurious to soybeans, 645.
- cultural treatment, Miss. 345.
- diseases and insects, control, Va. 637.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- effect of cluster thinning, 197.
- effect of modified storage atmosphere, Iowa 190.
- foliation, effect of time of pruning, 197.
- fruit rots, varietal reactions to, Fla. 620.
- grafted, in Missouri, Mo. 622.
- insect, new, in Missouri, 502.
- juices, unfermented, new types, 154.
- leaf folder, notes, Tenn. 502.
- muscadine, leaf spots and berry rots of, 769.
- muscadine, studies, Ga. 765.
- plume moth, biology and control, Mass. 787.
- production in eastern New Mexico, N.Mex. 623.
- propagation, T bud method, 197.
- rootstock, for, Calif. 52.
- stored, preparation of tablets for release of sulfur dioxide in packages, 478.
- tests in Oregon, status, 197.
- thrips, control, Calif. 88.
- Tokay, ripening, effect of seasonal heat, Calif. 52.
- varieties, La. 761.
- varieties, new, performance, N.Y.State 196.
- varieties, new, survey of growers, N.Y.State 765.
- variety tests, N.Mex. 191.
- vinifera, oxidizing enzymes of, properties, 295.
- Waltham Cross, drop berry and irrigation, 478.
- wastage, 478.
- white rot, review, 497.

Grapefruit—

- canned, and juice, use of dextrose in, Mass. 724.
- cost of production and returns on tree, Ariz. 676.
- fertilizers for, Ariz. 619.
- from Rio Grande Valley, ascorbic acid in, variations in, 709.
- Marsh, effect of storage temperatures, 478.
- Marsh, ripening and maturity measurements, Ariz. 57.
- maturity, factors involved, Ariz. 619.

Grapefruit—Continued.

- new storage rot of, Ariz. 628.
 - pulp, dried, for milk production, Fla. 241.
 - quality and yield, relation to fertilizers and cultural practices, Ariz. 619.
 - storage studies, 198.
 - vitamin C in, 705.
- Grapevine(s)—
- bleeding, effect, Calif. 52.
 - blight, new to South Africa, 368.
 - disease, Pierce's, or California vine disease, Calif. 65.
 - girdling, 478.
- Grapholita*—
- molesta*, *see* Fruit moth, oriental.
 - packardii*, *see* Cherry fruitworm.
- Graptolitha antennata*, *see* Fruitworm, green.
- Graptolitha* spp., studies, Iowa 218.
- Grass(es)—*see also* Grassland(s), Lawn(s), Meadow(s), Pasture(s), etc.
- adaptability to Arkansas, Ark. 612.
 - adapted to Iowa, fructosan content, 613.
 - and alfalfa meadows, effects of cultivating and manuring, Wyo. 43.
 - and forbs in southern Great Plains, 337.
 - and grass mixtures, endurance on athletic field, R.I. 753.
 - and legume pastures, yields and grazing days from, Wis. 522.
 - artificially dehydrated, nutritive value, Del. 100.
 - artificially dried, storage, 516.
 - as hosts of leaf rust of wheat, 359.
 - bends, a new disease of, 632.
 - boron in, Ky. 852.
 - breaking dormancy and increasing seed germination, Hawaii 182.
 - chlorine gas injury, 208.
 - diseases in Michigan, U.S.D.A. 64.
 - dropped, germination, factors affecting, 754.
 - effect of nurse crops, Utah 614.
 - fertilizer tests, Fla. 609.
 - flowering and growth, effect of day length and temperature, 183.
 - for soil conservation, Wash. 471.
 - forage, breeding, Wash. 471.
 - forage, diseases, Wash. 487.
 - forage, variety tests, Wyo. 43.
 - fructosan content, Iowa 151.
 - growth and flowering in response to different photoperiods, 458.
 - hybrids, smut and rust resistance, inheritance of, Wash. 471.
 - insects, studies, Kans. 84.
 - juice factor in milk of animals so fed, N.Mex. 239.
 - juice factor in plant and animal materials, distribution, 272.
 - lawn and turf, fertilizer tests, R.I. 753.
 - lawn and turf, variety tests, R.I. 753.
 - mixed, manure and fertilizer tests, Wash. 593.
 - mixtures, tests, Kans. 41.
 - morphology of growing point and inflorescence, 43.
 - new United States, 740.

Grass(es)—Continued.

of Wisconsin, additions to, 171.

pasture—

breeding, Kans. 40, Tenn. 470.

effect of reseeding and soil treatments, Iowa 182.

persistence of, Hawaii 181.

root development, and response to day length, R.I. 753.

seasonal development of roots, 170.

variety tests, S.C. 42.

yield and quality, relation to soil,

Fla. 589.

range, clipping, N.Mex. 231.

range, growth behavior and relative composition, effect of burning, Fla. 609.

range, growth in reduced light intensities, 323.

range reseeding trials with, N.Mex. 613.

range, tests, Wyo. 43.

resistance to snow mold, U.S.D.A. 64.

reversible action of invertase in, effect of temperature, 320.

seed production, effect of gall midges, 647.

seed yields under different conditions, Idaho 751.

seedlings on burned-over land, West. Wash. 471.

silage, *see* Silage.

smuts, variation in cultures of, 771.

sod, extent to be subdued, Iowa 182.

sod-forming and non-sod-forming, Idaho 751.

soil fertility studies with, Fla. 590.

South African, carotene in, 801.

stands, effect of time and method of seeding, Kans. 41.

tetany in cattle, 109.

turf, growth substances on, 338.

value for pastures of different types, Fla. 609.

variety tests, Fla. 608, Idaho 751, Kans. 40, Tenn. 470, Wash. 471, Wyo. 43.

yields in mixture v. alone, Wyo. 43.

Grasshopper(s)—

differential—

hyperparasite of, 798.

life history, U.S.D.A. 506.

wound healing in, 641.

early development, effect of X-rays, 641.

eastern lubber, biological habits, Fla. 641.

of economic importance, life histories and habits, U.S.D.A. 505.

of Ontario, parasitism, 785.

outbreaks in California, effect of birds, 490.

parasites, exchange between Argentina and Canada, 785.

population, effect of conservation areas, Kans. 84.

possible vectors of potato bacterial ring rot, N.Dak. 72.

prospects of damage from in 1941, Okla. 677.

studies, Iowa 218, Kans. 84.

two-striped, life history, U.S.D.A. 506.

grassland(s)—*see also* Grass(es), Meadow(s) and Pasture(s).

agriculture, adjustments in, 548.

effect of systems of management, Kans. 84.

of Argentina and Patagonia, 313, 337.

range, desert, relation to climatic and grazing conditions, Ariz. 608.

Gray hair produced by mineral deficiency and vitamin deficiency, nonidentity, 423.

Grazing—*see also* Range.

and agricultural ecology in Utah, historic records, 263.

crops for laying hens, Miss. 383.

effect on deep frost penetration, Wis. 446.

on irrigated meadows by range sheep, rotation paddock system, Nev. 472.

Green bug injury to oats unusual, Miss. 502.

Green manure—

crops, variety tests, Ariz. 608.

fertilizer experiments, S.C. 42.

in rotations of corn and cotton, effect on organic matter and N in soil, 338.

nonlegume, effect on fertility of forest nursery soils, 738.

rye, and hairy vetch v. manure for cotton, S.C. 42.

sweetclover, red clover, and dalea compared, Iowa 182.

Green manuring, effect, Fla. 590.

Greenhouse(s)—

air-conditioned, Calif. 115.

insect pests, biological control, 785.

leaf tier, stomach poisons for, toxicity and repellent action, 507.

pests, insecticides for, Miss. 502.

soils, fertility studies, Wash. 445.

studies, experimental designs to increase accuracy, 344.

thrips, effect of pH on toxicity of anti-mony compounds to, 784.

thrips on oranges, control, Calif. 83.

Greens or pot herbs, food and health from, 693.

Grouse—

endoparasites, of Wisconsin 405.

hazel, parasitic protozoa and role in fluctuation of population, 542.

ruffed, avian pox in, Mass. 815.

ruffed, parasites newly recorded for, 405.

ruffed, studies, Iowa 217.

Growth hormone of beef anterior pituitaries.

purification, 297.

Growth substances, *see* Plant growth substances.Grubs, white, *see* White grub(s).*Gryporhynchus tetrorchis*, new cestode from great blue heron, 381.Guava, *Cephaeleuros myocoides* on, control, Fla. 629.

Guinea

analyses and digestibility, Hawaii 231.

breeding, Hawaii 182.

Guinea pigs—

effect of crossing inbred lines, U.S.D.A. 177.

Guinea pigs—Continued.

- heredity of dilution and bleaching of coat, 464.
sensitized with acidfast group of organisms, interrelation between allergic responses, 665.
vitamin C requirement, 709.
- Gull, Franklin's, colonies on Great Plains, relation to agriculture, 499.
- Gum acacia as glycogenic food in rat, non-availability, 271.
- Gypsy moth on apple, Me. 642.
Gypsy moth on cranberry, 643, Mass. 786.
- Habronema muscae*, effect of phenothiazine on, 403.
- Haematobia irritans*, see Horn fly.
- Haemonchus contortus*, see Stomach worm(s).
- Haemoproteus danilewskii* in crows, 82.
- Hail insurance in central Kansas, Kans. 117.
- Halophytes, studies, 171.
- Hamster, inheritance of black coat color in, 465.
- Hanseniella vandykei* n.sp., description, 644.
- Harlequin bug—
control, Ala. 499.
egg parasites of, 217.
studies, Hawaii 218.
- Harmolita grandis*, see Wheat strawworm.
- Harmostomum pellucidum* in ruffed grouse, 405.
- Hawaii Station, report, 286.
- Hawk and owl pellet formation and identification, 499.
- Haws, May, varieties, Fla. 619, La. 761.
- Hay—
and pasture plants, strain tests, Mass. 752.
baler, traveling, Ariz. 257.
carotene losses in, factors affecting, 740.
crops, fertilization, Miss. 336.
crops, growth characteristics, Mich. 184.
crops, variety tests, N.Mex. 183.
curing in field, methods, Miss. 430, 545.
curing, pole-stacks for, Mich. 613.
early and late cut, relative values for cows, 240.
from native grass and clover, yields and mineral content, La. 752.
in rotation, response to fertilizers, Ky. 751.
mixed, digestibility by cattle and sheep, 238.
P content, effect of P fertilizers, La. 752.
stacks, built up, ventilation, West.Wash. 542.
- Hazelnut, chemical composition, 725.
- Heartworm, canine, treatment with fuadin and sulfanilamide, 538.
- Heat-of-wetting studies, Hawaii 160.
- Hegari fodder for prevention of blindness and edema in livestock, N.Mex. 239.
- Heifer(s)—see also Cow(s).
adequacy of home grown rations in protein and minerals, 522.
and lactating cows, normal live weight trends in, Ariz. 655.

Heifer(s)—Continued.

- delayed conception and sterility in, Ky. 747.
effect of combined phosphorus and protein deficiency in, 391.
fattening rations, comparison, Ariz. 650.
4-H dairy, growth and reliability of heart girth measurements for estimating liveweight, 518.
protein for, molasses yeast as source, Hawaii 238.
rumen contents, chemical changes with and without urea, 100.
spayed, open, and bred, relative efficiency in feedlot, Calif. 94.
twinborn with bulls, early recognition of freemartin condition, 39.
- Helianthus tuberosus*, regulation of tuberization in, 170.
- Heliothis obsoleta*, see Bollworm, Corn earworm, and Tomato fruitworm.
- Heliothrips haemorrhoidalis*, see Greenhouse thrips.
- Helminth(s)—
dilution-egg-count procedure, 539.
eggs, variation in dilution-counts, 248.
fauna of Minas Geraes, Brazil, 374.
of dogs and cats transmissible to man in Philippines, 112.
of muskrats in Texas, 374.
parasites in sheep, Va. 669.
- Helminthosporium*—
leaf and glume spot of rice, La. 772.
maydis, two physiologic races, 492.
oecium, notes, 363.
sacchari and *stenosporium*, studies, 495.
sacchari eyespot of sugarcane, 488.
sativum induced by zinc sulfate, variation, 208.
sativum, virulence of artificial inoculum of, 364.
- Hemiteles coffeicola* on coffee leaves, 66.
- Hemiptarsenus anementus*, biology and immature stages, U.S.D.A. 230.
- Hemitarsonemus latus*, notes, 85.
- Hemlock(s)—
annual rings in, relation to environment, 355.
invasion of, in younger Douglas fir stands, 202.
propagation, Mass. 762.
- Hemoglobin—
formation, rapidity of in anemia due to blood loss, 418.
production and amino acids in anemia, 128.
regeneration in anemic trout, 374.
- Hemoglobinuria, nonspecific, and acute pulmonary emphysema of cattle, 820.
- Hemophilus gallinarum* infection in chickens, atypical type, 540.
- Hemorrhagic—
disease in cattle, Nev. 527.
disease of newborn, vitamin K treatment, 141, 715.

Hemorrhagic—Continued.

polioencephalitis, Wernicke's, of man, and vitamin B₁ deficiency disease, of fox, 672.

septicemia, *see* Septicemia.

Hemp—

manila, *see* Abacá.

production and retting tests, Wis. 472.

production test, Miss. 337.

yield and cost per ton, Miss. 41.

Henry, W. A., biographical sketch, 121.

Hen(s)—

fat balances, 805.

formation of eggs and production in, Md. 178.

genetics of, sex-linked, imperfect albinism in, 329.

houses, evaporative cooling, Wash. 512.

laying—*see also* Egg production,

battery cages v. pen management, N.Mex. 231.

cage system of management, N.Mex. 390.

carotene requirements, Idaho 800.

fed consumed v. body fat and eggs produced, 96.

feeding methods, West.Wash. 518.

grazing crops for, Miss. 383.

light requirements, Wash. 516.

methods of feeding grain to, Fla. 651.

mill run in mash for, 96.

pelleted v. unpelleted all-mash diet for, 235.

protein requirements, Wash. 516.

range crops and grass silage for, Kans. 92.

rations and feeding methods, Ohio 805.

rations, pineapple bran and a yeast-fermented mash in, Hawaii 231.

vitamin A requirements, West.Wash. 518.

nutrition, balance between intake and outgo of Ca in, S.C. 92.

one-year-old v. older, for breeding flock, Ky. 801.

physical composition, effect of confinement in laying cages, 804.

selected for superior egg albumen, inherent differences, N.Mex. 231.

water consumption, 235.

Herbarium material—

preparation of stem sections, 325.

world wide collections necessary for efficient study, 170.

Heredity—

in farm animals, 604.

of bean powdery mildew resistance, 492.

of broodiness in Rhode Island Red poultry, Mass. 35.

of color, *see* Color inheritance.

of dilution and bleaching of coat in guinea pigs, 464.

of oat smut resistance in hybrids, 746.

of pathogenic characters of *Puccinia graminis tritici*, 326.

Heredity—Continued.

of plumage color in *Phasianus colchicus*, 746.

of shell finish in White Leghorn eggs, 36.

of three coat color mutations in ranch-raised minks, 747.

of wheat stem rust resistance in crosses, 462.

Herring gulls, wild. A-pergillosis in, 406.

Hessian fly resistance in wheat varieties, 499, Kans. 84.

Hessian fly, studies, Iowa 218, Kans. 84.

Heterakis gallinae in grouse, 406.

Heteroauxin action on beans, 500.

Heteroauxin in soils, estimation, 19.

Heterodera schachtii—

adhering to seed potatoes, formalin treatment for, 363.

identification of strains, 365.

Hizamita columbae in pigeons in California, 406.

Hizamita disease of turkeys, Calif. 104.

Hexuronic acid, *see* Ascorbic acid.

Hickory nut, chemical composition, 725.

Highways, *see* Road(s).

Hippelates, *see* Eye gnats.

Hippuric acid and prothrombin tests, clinical application, 428.

Histidine requirements by chicks, 389.

Histological technic, 30.

Histomonas meleagridis infection in turkeys, type of liver lesions in 541.

Hog cholera—

prevention, crystal-violet vaccine for, 536, 664.

vaccine, new, development, Calif. 104.

Hoes, *see* Pig(s) and Swine.

Holly—

American, *Fusarium* dieback of, N.J. 782.

bud moth control, West.Wash. 503.

leaf miner parasite, biology and postembryonic development, 798.

tar spot, morphology and life history of fungus causing, 78.

Homogenization index calculated from measurements of fat globule size, 520.

Homogentisic acid, excretion, effectiveness of ascorbic acid in preventing, 572.

Honey—

plant test garden, 640.

production, effect of meteorological factors, Iowa 218.

production under drought conditions, 640.

transformation of nectar into, factors in, Iowa 218.

Hop(s)—

downy mildew infections, sporulation injury associated with, 771.

increase in production and disease control, N.Y.State 763.

pollen germinated on artificial substrates, viability, 459.

Hopkins, C. G., biographical sketch, 121.

Hoplomitilla genus, monographic treatment, Minn. 648.

- Hormonal preparation of rats for lactation, 518.
- Hormone(s)—
 administration, methods for induction of heat in spayed animals, 603.
 and vitamins in cosmetics, 131.
 effect on melanophore differentiation in birds, 608.
 female sex, research, 334, 607.
 gonadotropic, *see* Gonadotropic.
 lactogenic, effect on mammary involution in mice, 469.
 male, secretion by sparrow testis, relation to interstitial cell hyperplasia, 603.
 of anterior pituitary, follicle-stimulating, purification, 179.
 plant, *see* Plant growth substances.
 sex, administration for induction of heat, methods, 750.
 sex, effect on broodiness in fowl and pigeon, 604.
 sex, effect on gonad development of chick embryos, 468.
 sex, modifications of bones of animals receiving, 38.
 sex, of horse urine, psychical activity, 606.
 sex, vaginal response to, and vitamin A, 606.
 sheep and beef pituitary, solubilities, 607.
 sprays for retarding apple drop, Wash. 477.
 yields, expression, relation to different *Avena* test methods, 741.
- Horn fly(ies)—
 life history and control, U.S.D.A. 89.
 on cattle, arsenic ineffective for control, 379.
- Hormaltica* new genus, erection, 89.
- Horse(s)—
 action of stimulants on, 528.
 blood, variations in calcium, inorganic phosphorus, and serum proteins, 537.
 costs, Mich. 264.
 draft, N, Ca, and P balances during rest and work, Iowa 231.
 draft, type and breeder, 381.
 parasite of, Ky. 815.
 phenothiazine as anthelmintic in, 403, 671.
 reproduction and fertility in, Md. 178.
 roundworms in, Calif. 104.
 situation, discussions, Ind. 804.
 strongyle larvae, infective, survival, 403.
 strongyles, behavior of infective larvae 818.
 thoroughbred, production, problems in, 381.
 vitamin A deficiency in, 112.
 wheat feeding experiments, Oreg. 802.
 young, incoordination in, Ky. 815.
- Horseapple, white, control, Ariz. 608.
- Horsefish vapors, bactericidal properties, 157.
- Horticultural protection service, Federal-State, report, Fla. 588.
- Horticulture, dictionary, second revision, 477.
- Hormone A, effect on rooting of plant cuttings, 318.
- Housefly—
 eggs, toxicity of nicotine to, effect of chlorides, 227.
 toxicity of alkyl secondary amines to, 797.
 toxicity of *Tephrosia virginiana* constituents of root to, 228.
- Household equipment studies, 257, 285, Me. 717.
- Houses, evaporative cooling, Wash. 542.
- Humans, normal and malnourished, riboflavin in blood and muscle, 274.
- Humidity control in incubator room, hair-hygrostat with magnetic switch for, U.S.D.A. 501.
- Humidities, high atmospheric, maintenance for entomological work, 641.
- Hunt, T. F., biographical sketch, 121.
- Hunterellus hookeri*, notes, P.R. 800.
- Hyalopterus arundinis*, *see* Plum aphid, mealy.
- Hybridization, *see* Plant breeding and *specific animals and plants*.
- Hydnum erinaceus*, notes, 372.
- Hydrocarbons, bacterial utilization, 461.
- Hydrogen—
 cyanide toxicity to forms of plant and animal life, 456.
 sulfide toxicity to forms of plant and animal life, 456.
- Hydrographs, sprinkled-plot, analysis, 302.
- Hydrologic research, deficiencies in, 302.
- Hydrology, reports and papers, 302.
- Hydrophobia, *see* Rabies.
- Hydrophyllum* genus, notes, 170.
- Hylastes* genus, taxonomic revision, U.S.D.A. 228.
- Hylemyia abdona*, notes, 785.
- Hylemyia antiqua*, *see* Onion maggot.
- Hylemyia brassicae*, *see* Cabbage maggot.
- Hymenolepis—
cariosa in poultry, treatment, 114.
cariosa in ruffed grouse, 405.
 spp. in crows, 82.
- Hypera brunneipennis*, notes, Ariz. 641.
- Hyperthyroidism, experimental, effect of thyroprive goat's milk, 518.
- Hypoderma crosii* in northwest India, bionomics, 88.
- Hypophyseal lactogenic preparations, assays, 181.
- Hypophysectomy, effect on reaction time to an electric shock, 38.
- Hypophysis, *see* Pituitary.
- Hypoprothrombinaemia, treatment, synthetic vitamin K in, 715.
- Ice and snow, lists of current publications, 303.
- Ice cream—
 acid casein for use in, preparation, 520.
 common defects, causes and control, 527.
 dryness when drawn from freezer, effect of homogenizing pressures, 520.
 effect of pasteurization on *Escherichia coli* in, 658.

Ice cream—Continued.

- Escherichia-Aerobacter* organisms in, methods of estimating, Kans. 98.
- home-made, 663.
- homogenization, 102.
- Kansas, ingredients used in, Kans. 98.
- melted, factors affecting appearance, Mass. 810.
- mix, dextrose and cereose sugar replacing cane sugar in, Mo. 246.
- mix, simplified vacuum solids test, limit of error, 726.
- retail sale, effect of weather, Md. 239.
- shrinkage, 397.
- stabilizer, effect of antioxidants on, Mass. 810.
- stabilizer, monoglyceride-gelatin as, 520.
- stabilizing agents, properties, 397.
- study, motion pictures as medium, 520.
- technical literature of, 815.
- use of frozen Utah fruit for, 238.
- whipping in, control, 520.

Idaho Station publications available for free distribution, Idaho 430.

Idaho Station, report, 864.

Ilva to *Juglans*, check-list revision, U.S.D.A. 628.

Illinoia pisi, see Pea aphid.

Illinoia solanifolia, see Potato aphid.

Illinois University, notes, 287.

Immortelle trees, disease of in Trinidad, 370.

Index numbers of prices and production, Ky. 687.

Index numbers of production, prices, and income, Ohio 548, 830.

Indiana Station, notes, 144, 431, 845.

Indole in bacterial cultures, photoelectric determination, 460.

Indole-3-acetic acid, effect on rooting of plant cuttings, 318.

p-Indolylacetic acid action on beans, 599.

Indolylacetic acid—

effect on germination and early growth of wheat, 598.

in talc dust, effect on rooting of stem cuttings, 318.

Industry—

decentralized, effect on security of rural populations, 841.

relation to agriculture, 548.

Infant(s)—see also Children.

age at time of cutting first tooth, relation to vitamin D intake, 573.

feeding, unboiled base exchange treated milk in, 562.

meat in diet of, 413.

newborn, ascorbic acid in plasma, variations in concentration, 135.

serum phosphatase, calcium and phosphorus values, 696.

Infiltration—

capacity, derivation, 302.

method for study, 164.

Influenza—

equine, Nev. 527.

virus, complement-fixing antigen of, 398.

Inheritance, see Heredity.

Inoculum, preparation with mechanical liquefier, 490.

Insect(s)—see also Entomology.

aerial, mechanical trap for sampling, U.S.D.A. 501.

and myriapods, embryology of, 83.

attacking rice in storage, U.S.D.A. 505.

beneficial, Fla. 641.

beneficial, parasitic, introduction and colonization in Puerto Rico, P.R. 798.

beneficial, value for control of scales and other pests, Calif. 83.

blood studies, Idaho 786.

collected in Laurentide Provincial Park, Quebec, 785.

control, bird friends more effective than fire, Miss. 143.

control, chemistry in, 642.

control, conversion tables and equivalents for use in, U.S.D.A. 501.

control, insecticide deposit required for, Tenn. 502.

control methods, contributions by English workers, 641.

convenient mount for, 502.

damage in Maryland, new developments, 373.

economic, of Canada, 84.

forest, see Forest insect(s).

garden, control, Miss. 502.

germ cells, effect of colchicine, 501, 641.

immature, classification, 375.

important, of the year, Tenn. 502.

in greenhouses, fumigants for, 640.

injurious—

and climate, Kans. 84.

of Washington, bibliographical catalog, 218.

to crops, see special crops.

to man and animals, Iowa 218.

leaf-eating, laboratory rearing, 218.

metabolism, relative effects of temperatures from constant and variable sources, 500.

micro-organisms, and pollen, air-borne populations of, technics for appraising, 66.

mortality experiments, technic for recovery of very small dead ones, U.S.D.A. 501.

mount, inexpensive, N.Dak. 218.

new, and new host records, Hawaii 218.

numbers caught in light trap at Rothamsted, 642.

of Brazil, 85.

on Spanish moss, woods trash, etc., U.S.D.A. 501.

orchard, see Orchard insect(s) and Fruit insect(s).

parasitism, experimental studies, 648.

pest(s)—

control constant challenge to science, N.Y.State 219.

geographical distribution, 83.

in Canada, biological control, 785.

in Canada, summary, 785, 786.

in Portuguese East Africa, 85.

Insect(s)—Continued.

pest(s)—continued.

- in Samoa, not yet in Hawaii, 787.
- of farm, garden, and orchard, revision, 501.
- of shade trees, 640, 644.
- of stored grain, U.S.D.A. 789.
- of the kurrajong, 86.
- record for Oklahoma, 84.
- treatise, 375.
- populations, racial segregation in, and significance, 217.
- predators of India, important, 85.
- problem in stored grain, N.Dak. 219.
- protection of food against, transparent films for, Wis. 503.
- repellents, 87.
- reproduction, dust as inhibiting factor, 784.
- resistance in plants, economic value and biologic significance, 789.
- response to light of different wavelengths, 83.
- scale, *see* Scale insect(s).
- speciation in Hawaii, problems, 500.
- studies, Del. 84.
- studies, temperature-humidity controlled cabinets for, U.S.D.A. 501.
- subterranean, relation to raspberry crown gall, Minn. 643.
- vector and nonvector, relation to plant viruses, 789.

Insecticide(s)—*see also* Spray(s) and specific forms.

- analyses, Me. 479.
- chemistry of, Wash. 503.
- combinations for cotton insects, 504.
- containing dinitro for black cherry aphid, Wis. 503.
- division, work, U.S.D.A. 501.
- droplet size of, 642.
- effect on mortality of electrostatic charges produced by friction in applying, 787.
- ingredients, density and flowability, Ohio 489.
- inspection and analyses, N.J. 191.
- methods of testing against bedbugs and cockroaches, 642.
- new contact, tests, 785.
- stickers, rosin-mineral emulsion as, 642.
- studies, Me. 642.
- tests, 86, Mass. 786.
- vapor-spraying equipment for, U.S.D.A. 261.

Insemination, artificial—

- comparison of ram semen collection methods for, 327.
- conference on, 327.
- in range cattle, 327.
- of bovine, improved method, 327.
- of chickens, N.J. 467.
- of dairy cows, Kans. 98.
- variations in bull semen used in, Mo. 330.

Insolation and prediction of maximum temperatures, 585.

Instrument, new increment core, and coring wrinkles, 485.

- Insulation, farm-building, Iowa 257.
- Insulin, physiological activity, effect of high pressure treatment, 853.
- Intermountain States Bee Culture Field Laboratory, work of, Wyo. 91.
- Intersexuality, in rat, 606, 749.
- Intestine, small, sympathetic innervation, 528.
- Invertase activity, daily changes in, 320.
- Iodides, toxicity to corn, antagonistic action of chlorides on, 455.

Iodine—

- and element 85 (ekaiodine) metabolism, comparison, 271.
- in nutrition of sheep, 234.
- of soils and rocks, S.C. 14.
- starch complexes, absorption, spectra, Iowa 151.

Ions, availability by soil testing method, 740.

Iowa College, notes, 144.

Iowa Station, report, 286.

Iris, southern, tulip bulb aphids on, control, 785.

Iris, testing and propagation, Fla. 610.

Iron—

- absorption and distribution in blowflies, 89.
- assimilation, relation to dietary calcium-phosphorus ratio, 417.
- available in fish, 128.
- balances on preschool children, 696.
- in green v. bleached vegetables, Miss. 556.
- in liquid food products, determination, 6.
- in *Lucilia cuprina*, 89.
- in milk, effect of iron in rations, Mass. 809.
- in sugarcane and sorghum sirup, value, Miss. 412.
- in tissues of normal, anemic, and iron-enriched rats freed from blood, 695.
- metabolism, 128.
- metabolism studies in normal and iron-deficient rats, 695.
- migration in colloidal systems, Ill. 15.
- radioactive, as hemoglobin in red cell, 561.
- starvation, relation to over-phosphating and sulfur treatment on clay, 313.
- studies, Ariz. 693.
- utilization in anemia due to blood loss, and rapidity of hemoglobin formation, 418.

Irrigation—

- all-season, effect on farm income and expenses, Idaho 829.
- district, Yakima-Tieton, economic conditions and problems, Wash. 548.
- equipment, new, Calif. 115.
- fertilizer placement under, 312.
- of Havana Seed tobacco, Conn.[New Haven] 760.
- portable-sprinkler systems for, Calif. 115.
- project, Huntley, size of farms and tenure on, Mont. 118.

- Irrigation—Continued.
 spring run-off, increasing, results from, Idaho 829.
 tree and fruit responses to, Wash. 477.
 water, duty of, N.Mex. 258.
 water in Pinal Co., cost of pumping, Ariz. 676.
 water of Hollister area, California, quality, U.S.D.A. 367.
 water, prolonged ponding for alkali control, Wyo. 115.
 water pumping costs, Utah 258.
 water, waste under various applications, Wyo. 115.
- Isocnurothrips obscuratus* n.sp. from New Zealand, 87.
- Isoospora* sp. in crows, 82.
- Itopectis montana*, parasite of hemlock saw-fly, 230.
- Jacks, enrollment, Ind. 801.
- Japanese beetle—
 control, U.S.D.A. 227.
 control with milky white disease, Md. 219.
 control with natural enemies, N.Y.State 227.
 cooperative work in Maryland, 791.
 hibernating larvae, mortality of, 90.
 larvae, estimating populations, 511.
 larvae, milky disease on, development, 512.
 outlook, 227.
 spread, prevention, 785.
 survival through metamorphosis, 89.
 traps, color, position, etc., 511.
 use of traps against, 511, U.S.D.A. 227.
- Job's-tears, elongation of mesocotyls and internodes in, 741.
- John's bacillus, growth factor, antihemorrhagic compounds as, 252.
- John's disease, tuberculin reactions in cattle infected with, 821.
- Johnson grass control, Ariz. 181, Miss. 41.
- Juglandaceae, morphology of flowers, 31.
- Jujube trees, Chinese, rust on, Fla. 629.
- June beetle(s)—
 green, control, Ky. 786.
 in Wisconsin, proportion of sexes in, 784.
 southern green, control in lawns, U.S.D.A. 501.
- Juniper midge—
 history and biology, 378.
 studies, Kans. 84.
- Juniperus* to *Larix*, check-list revision, U.S. D.A. 628.
- Kalanchoe, flowering, effect of short-day treatments, Ala. 477.
- Kale, boron in, Ky. 852.
- Kansas College, notes, 287.
- Kansas Station, notes, 287.
- Kansas Station, report, 143.
- Kelp from Pacific coast, boron in, Ky. 852.
- Kelp meal, value for dairy animals, Md. 239.
- Kentucky Station, notes, 431.
- Kentucky Station, report, 864.
- Kentucky University, notes, 431.
- Keratitis—
 infectious, in cattle on range and feed lots, Ariz. 664.
 of feeder cattle, Kans. 104.
- Ketosis—
 and glucose therapy, effect on butterfat synthesis, 519.
 cattle, glucose therapy in, 519.
 cow, effect of use of β -hydroxybutyric acid, glucose, and oxygen by mammary gland, 519.
 in dairy cattle, Idaho 815.
 in dairy cattle, relation to blood sugar and CO_2 combining power of plasma, 392.
- Kidney worms in swine, methods of sanitation in control, S.C. 105.
- Klamath midge, studies, 502.
- Klamath weed, suppression by burnet, Calif. 40.
- Knapweed—
 gall fly, egg distribution of chalcid parasites of, 798.
 Russian, control experiments, Wash. 471.
- Kohlrabi, ascorbic acid in, 424.
- Kudzu, feeding value for poultry, Ala. 515.
- Labopidea albi*, studies, Iowa 218.
- Laborers, migrant, in sugar beet industry, Mich. 120.
- Lace bugs, new American, 644.
- Lactation—
 hormonal preparation of rats for, 518.
 in rat, inhibition, 607.
 studies, 239.
- Lactic acid—
 bacteria, classification, significance of fermentation studies, 174.
 bacteria, heterofermentative, nutritive requirements, 297, 326.
 bacteria, pure cultures, maintenance, 661.
 fermentative production, agricultural products for, Iowa 151.
 in blood, determination, 726.
 production and uses, 295.
 requirements of bacteria, Iowa 151.
- Lactobacilli growth stimulation by *Streptococcus* extracts, 304.
- Lactogen, International Standard, assay methods using, 607.
- Lactose, utilization, effect of salt mixtures, Mass. 845.
- Lactuca pulchella* infection by perennial rust, 206.
- Lake fauna, biological action of rotenone on, 641.
- Lamb(s)—
 brooder, electric, description, Wash. 116.
 cottonseed cake v. phosphate salt mixtures for, Wyo. 93.
 early and late, fattening, Mo. 386.
 embryonic, muscular system, relation to ration of ewe, 386.
 fattening, bean straw in ration, Wyo. 653.
 fattening, corn v. beet products, Idaho 801.

Lamb(s)—Continued.

- feeding records and net returns, N.Mex. 263.
- full-fed and maintenance-fed, wool and skins of, 234.
- ground and unground Russian-thistles for, Wyo. 93.
- in feedlot, overeating, Mich. 253.
- limestone and protein supplements for Kans. 92.
- newborn Astrakhan, bone measurements 386.
- pasturing a poor corn crop with, Wyo. 93.
- pasturing alfalfa, sweetclover, and Sudan grass with, Wyo. 93.
- production by ewes bred to rams of different breeds, Miss. 517, N.Mex. 231.
- production, single and twin, breeding for, 382.
- range, feeding and finishing rations, Nev. 516.
- self-feeding, Wyo. 93.
- spring, seasonal prices, Ky. 829.
- stiff disease, relation to feeding and management, 382.
- suckling, creep-fed grain mixtures for, Ky. 801.
- use of various rations by, Kans. 92.
- Lampronia rubiella*, notes, 785.
- Lamps, projector, for brooding chicks, Ohio 518.
- Land(s)—see also Farm land.
- and fiscal problems in Reynolds Co Mo. 679.
- burned-over, seedlings of grasses and legumes on, Idaho 751.
- classification and size of business, by land classes, Del. 117.
- credit, see Agricultural credit.
- cut-over, see Cut-over lands.
- eroded, black alder as pioneer tree on 485.
- for grazing, value, formula for estimating, Wyo. 118.
- form types, analysis and classification Mich. 14.
- in mineral areas, surface ownership and assessed valuation, Okla. 677.
- leaders on, U.S.D.A. 267.
- levelling to aid penetration by irrigation water, Ariz. 257.
- reclamation and conservation research, Idaho 828.
- relations and population, R.I. 812.
- settlement, English, at Rugby, Tennessee, Tenn. 689.
- settlement in Cullman Co., Alabama, by German immigrants and Georgia crackers, U.S.D.A. 843.
- surface, year of evaporation from, 302.
- tenure and ownership on irrigation project, Mont. 118.
- use adjustments on unit demonstration farms, 161.
- use and nitrogen relations, 449.

Land(s)—Continued.

- use, changes in, erosion problems arising from, Mass. 729.
- use, effect of mineral developments, Okla. 677.
- use in New Castle Co., Del. 548.
- use planning, coordination with State agricultural program, Utah 717.
- use planning project, selection of committee members, Ky. 841.
- use planning, relation to geographical regions in agriculture, Okla. 677.
- use problems in Martin Co., programs and policies, Ind. 830.
- use problems in Massachusetts, Mass. 830.
- use, trends in, Ky. 829.
- valuation, role of soil depletion in, 676.
- watershed, control of water flow and silt transportation, Tex. 448.
- Landscaping, home, enriches rural living, Utah 717.
- Lanital, descriptions and photomicrographs, 141.
- Laphygma ex gva*, see Armyworm, beet.
- Laphygma frugiperda*, see Armyworm, fall.
- Larch—
- mycorrhizal relations, 601.
- western, ring growth, 588.
- Lard held in low-temperature storage for different intervals, keeping qualities, effect of soybeans, Iowa 231.
- Larra americana*, establishment in Puerto Rico, 229.
- Laspyrestia nigricana*, see Pea moth.
- Lavatera* to *Lonicera*, host-parasite check list revision, U.S.D.A. 768.
- Lawn(s)—
- renovation, Ohio 616.
- weeds, control, R.I. 753.
- Lawngrasses, tests, N.Mex. 191.
- Lead arsenate—
- and copper spray mixture, effect of lime and weathering, 52.
- injury to health of people exposed to it, 642.
- substitutes for apple pests, Wash. 503.
- toxicity to bees, 228.
- toxicity to livestock, Wash. 527.
- Lead in biological material, 698.
- Lead retention by growing organism, effect of calcium and phosphorus, 851.
- Leaf(ves)—
- extract, different concentrations, comparative transmission spectrograms 457.
- extract, irradiated, comparative transmission spectrograms of, 457.
- green, chlorophyll-protein compound, 597.
- hexenaldehyde obtained from, origin, 171.
- killed, oxidation-reduction reaction, 171.
- of forest trees, boron in, Ky. 852.
- temperature, measuring, new device for, 459.
- Leaf-footed bug, control, Fla. 641.
- Leafhopper(s)—see also special hosts.
- blunt-nosed, on cranberry, 643, Mass. 786.
- control by spraying and dusting, 788.

Leafhopper(s)—Continued.

effect on apple trees, 648.

feeding habits, 377.

possible vectors of raspberry mosaic, 219.

Leontium nigroasiaticum, see Terrapin scale
Legge, A., biographical sketch, 121.

Legume(s)—see also Green manure and Alfalfa, Clover, etc.

boron in, Ky. 852.

effect on plant growth and nitrogen balance, Kans. 13.

excretion of nitrogen by, factors affecting, 735.

for green manure, variety tests, Ariz. 181.

forage, effect of seed treatment on stands, 338.

handling, equipment for, Tenn. 542.

in rotation, residual effects, Ky. 751.

inoculants, inspection, Ind. 735.

inoculation—see also Nodule bacteria.

methods in Florida soils, Fla. 589, 609.

methods of preserving by ensiling, 651.

native, root nodule bacteria of, Ariz. 608.

nodule formation and nitrogen fixation, 452.

nodule production and oxidation of ethyl alcohol, 317.

nutrient deficiency symptoms in, 357.

pasture, persistence of, Hawaii 181.

pasture, studies, Fla. 609.

seedling stands, effect of pythiaceae and other fungi, Iowa 205.

seedlings, methods of watering pots containing, Iowa 160.

value of drilling limestone for, Mo. 739.

variety tests, Fla. 609, Kans. 40.

white grubs in, Wis. 503.

winter and summer, for cotton and corn, Miss. 337.

winter, for soil improvement, Miss. 337.

wound healing in, 160.

Leguminosae, symbiotic promiscuity in, 316.

Lemna—

minor, use for plant nutrition studies, 596.

response to growth substances, measurement, 318.

Lemon(s)—

gummosis, cause, 77.

storage, 478.

tree decline, causes, Calif. 52.

Leontideus trabea, notes, 498.*Lepidium* roots, analysis of carbohydrate, and sulfur sulfate method, 5.

Lepidoptera, South African, life histories, 85.

Lepidosaphes beckeri, see Purple scale.

Leprosy, experimental production in chorionallantoic membrane of chick embryo, 818.

Leptinotarsus decemlineata, see Potato beetle, Colorado.*Leptocoris trivittatus*, see Boxelder bug.*Leptoglossus phyllopus*, see Leaf-footed bug.*Leptophaeria salvinii* stem rot fungus, longevity of sclerotia, 70.

Leptospiroses of dogs in Japan, 528.

Leptostroma canaliculac of Zanker, taxonomy, 315.

Lespedeza—

early planting for success, Miss. 336.

fertility and pH levels for, S.C. 42.

fertilizer tests, Fla. 609, La. 752.

Korean, analyses, Tenn. 437.

Korean, selection and improvement, Del. 40.

Korean, yields, effect of dodder, 348.

nutritive value for poultry, S.C. 92.

variety tests, Fla. 608, Iowa 182, La. 752, Md. 182.

Lespedeza sericea, see Sericea.

Letters, circular, preparation and use, U.S.D.A. 122.

Lettuce—

ascorbic acid in, 424.

boron in, Ky. 852.

Botrytis disease control and relation to damping-off and mildew, 361.

breeding, Ariz. 190, 619, S.C. 48.

choice, early planting a requirement, Miss. 347.

Colorado head, riboflavin content, 427.

diseases, control, Fla. 620.

fertilization, Ariz. 619, S.C. 48.

growth on peat soil, variation in water table and soil moisture due to, 347.

head, culture in cold-frames, N.Mex. 191.

head production in, relation to temperature and time of planting, Fla. 619.

head, time of planting, N.Mex. 191.

Iceberg, harvesting and packing, Mass. 830.

Imperial strains, U.S.D.A. 50.

irrigation requirements, Ariz. 190.

krant and juice, 133.

leaf spot, notes, 86.

powdery mildew, inheritance of resistance to, 493.

response to fertilizers, rapid soil tests in relation to, Fla. 589.

rot due to *Erwinia carotovora*, Ariz. 628.

seed storage, Ariz. 619.

seedlings, excised parts, culture correlative phenomena in, 170.

strains and fertilizers, Fla. 619.

varieties, Wis. 478.

variety tests, Fla. 619, S.C. 48.

waste, and alfalfa, comparative position, Ariz. 650.

wireworm damage on irrigated land, U.S.D.A. 513.

yellow disease, [N.Y.] Cornell 72.

Leucochloridium piceae in ruffed grouse, 405.*Leucocytozoon sakhaloffi* in crows, 82.

Leucosis, fowl—

cultivation of causative agent in vitro, 404.

effect of feeding whey mash, West Wash. 530.

infectious type, transmission, Iowa 247.

mode of inheritance of resistance to, Iowa 247.

production of antibodies against agent of, Iowa 247.

- Leucosis, fowl—Continued.
 radiant energy in study of, Iowa 247.
 studies, Wash. 528.
 susceptibility, relation to iritis, West. Wash. 466.
- Leukemia**—
 and allied conditions in animals, etiology, Fla. 665.
 in mice, effect of foster nursing, 330.
 lymphogenous, studies, Kans. 104.
 spontaneous, back-cross test for determiners, 747.
 spontaneous mouse, genetics of, 746.
- Levulose**—
 dissimilation by heterofermentative lactic acid bacteria, 293.
 from chicory, dahlias, and artichokes, Iowa 151.
- Lice**—
 body, sensory physiology, 790.
 body, unmated, effect of nutrition on egg-production and longevity, 790.
 crab, in hair of head, 790.
 slender, of pigeons and doves, and descriptions of new species, 790.
- Lichen**, ground, poisoning from, Wyo. 105.
- Life**, latter half, nutritional requirements, 848.
- Light**—*see also* Sunlight.
 effect on plant growth habit, 745.
 of different wavelengths, reactions of insects to, 83.
- Lignin**—
 chemistry of, Minn. 581.
 of plants preceding tobacco, effects, Mass. 752.
 relation to absorption of minerals by plants, Mass. 724.
- Lilac** propagation, Mass. 762.
- Lilium formosanum***—
 cultural studies, 61.
 tetraploid plant in, 84.
- Lima beans**, *see* Beans, Lima.
- Lime**—*see also* Calcium and Liming.
 effect on pasture herbage and botanical composition, Va. 611.
 movement in pasture soils, Mass. 729.
 + phosphate studies, Tenn. 445.
 requirements of soils, *see* Soil(s).
 treatment and soil acidity at various depths, 311.
- Lime trees**, Tahiti, bark disease, Fla. 629.
- Limestone**—
 drilling for legumes, Mo. 739.
 fineness, effect on soil reaction, Mass. 729.
 T. V. A., use on pastures, N.C. 184.
- Lime-sulfur**, dry v. liquid, insecticidal values. Wash. 503.
- Liming** materials from calcium silicate slags, Ala. 445.
- Limnius***—
californicus, *see* Wireworm, sugar beet.
cctypus, *see* Wireworm, eastern field.
- Linkage studies**—
 of rats, 747.
 with induced translocations in mice, 747.
- Linolenates**, alkyl, preparation, 295.
- Linolenic acid**, thiocyanogen value, 294.
- Lipoptena cerri***, new record in New York State, 648.
- Lissorhoptrus simplex***, control, La. 772.
- Listerellosis** in swine, criteria for diagnosis, 664.
- Listeria***—
 genus, antigenic structure of organisms, 248.
monocytogenes, infection in sheep, 253.
monocytogenes, new sheep disease caused by, Colo. 822.
 strains, biochemical reactions, 398.
- Litomosoides carinii***, new host record in muskrat, 374.
- Live oak** powdery mildew disease, 372.
- Liver**—
 and adrenal androgen of rat, 749.
 beef, condemnations, 382.
 beef, fraction, effect on fat synthesis in rats, 413.
 cirrhosis, experimental production by deficient diet, 141.
 extraction of lactogenic substance from, 603.
 flavin content, effect of muscular work, 420.
 fluke of cattle, control in Hawaii, 535.
 function, hippuric acid test for, value, 428.
 injury, effect of vitamin K in hypoprotrombinemia, 428.
 normal and cirrhotic, riboflavin in, 420.
 pantothenic acid in, 442.
- Livestock**—*see also* Animal(s), Mammals, Cattle, Sheep, etc.
 auctions in Minnesota, Minn. 837.
 cooperative associations, volume of business, Iowa 262.
 diseases, *see* Animal diseases and specific kinds.
 fattening, beet byproducts for, Wyo. 93.
 feed, summer legumes best utilized for, Miss. 470.
 industry, research in nutrition for, 650.
 marketing, textbook, 121.
 mineral hunger in, 93.
 mineral requirements, Oreg. 801.
 most important source of farm income for North Dakota, N.Dak. 117.
 New York, marketing, [N.Y.] Cornell 837.
 rations, role of salt in, 652.
 statistics, *see* Agricultural statistics.
 trends in production and foreign trade for, U.S.D.A. 682.
 work, feeding, Miss. 383.
- Locations** on maps and photographs, designation of, 740.
- Locust (insect)**—
 brown, attractiveness of chemicals and bait carriers to, 85.
 brown, parasite of, 85.
 desert, studies, 644.
 Philippine, relation to Taiwan, 790.
 red, tests of poison bait against, 85.

- Locust, black, (tree)—
 growth-form variation in, importance in farm planting, 62.
 possible virus disease in Kentucky, U.S.D.A. 768.
 seedlings, frost heaving and damage to, 203.
 shipmast and common forms, distinguishing, U.S.D.A. 203.
- Locusta migratoria migratorioides*, mite parasites of, 85.
- Log scaling, application of sampling to, 627.
- Lolium temulentum*, endophytic fungus of, 634.
- Loquat fruit thinning, 484, Calif. 52.
- Louisiana Station—
 North Station and Rice Station, reports, 864.
 notes, 718.
- Lovegrass, range reseeding trials with, N.Mex. 618.
- Lucilia*—
cuprina, action of larvicides on, 89.
cuprina, iron in, 89.
sericata, toxicity of chemicals to, 59, 510.
- Lucuma* to *Magnolia*, host-parasite check list revision, U.S.D.A. 768.
- Lumarith, substitute for glass in seedbed sash, Conn.[NewHaven] 760.
- Lumber—see also Timber and Wood.
 chemically treated green, fungi associated with stain in, 81.
 distribution and consumption, U.S.D.A. 64.
 use in farm-building construction, Iowa 257.
- Lungworms—
 of swine, viability of eggs, 824.
 transmission of swine influenza virus by, 823.
- Lupines, *Fusarium* [*Martiella* group] hypocoetyl rot of, 768.
- Lycopene, fate of in passage from diet in cow, 100.
- Lycopodium chilense*, resistance to curly top virus, Idaho 769.
- Lygus*—
 bugs, factor in alfalfa seed crop failures, Utah 615.
 insects on alfalfa, possible control, Idaho 786.
pratensis, see Tarnished plant bug.
 spp., damage to alfalfa, relation to seed production, 221.
 spp., injury to peaches, prevention, 221.
- Lyme-grass, sea, disease caused by *Ustilago hypodytes*, 207.
- Lymphadenitis—
 caseous, in sheep and goats, Calif. 104.
 caseous, of deer, 110.
 in New York cottontail rabbits, 783.
- Lymphoblastoma in dairy cattle, 821.
- Lymphomatosis of laying hens, Calif. 104.
- Lysine requirements by chicks, 889.
- Macadamia—
 nuts, analyses and vitamin assays Hawaii 268.
- Macadamia—Continued.
 nuts, storage, U.S.D.A. 411.
 nuts, studies, Hawaii 190.
 oil, physical properties, Hawaii 190.
- Macaroni—
 cooked, composition and energy value, 691.
 making quality of durum wheat, effect of blight and other damage, 70.
- Machinery, see Agricultural machinery.
- Macrocentrus ancylovorus*, notes, 514.
- Macropsis insignis*, feeding habits, 377.
- Macropsis trimaculata*, see Plum leafhopper.
- Macrorespirometer, of constant pressure type, 296.
- Macrosiphum gaei*, feeding habits and penetration rates, 376.
- Macrosporium*, pathogenicity and taxonomy of species, Fla. 629.
- Maglicicada septendecim*, see Cicada, periodical.
- Magnesium—
 and calcium conservation, Tenn. 445.
 availability in fertilizer components, R.I. 730.
 availability, methods for determining, 6.
 deficiency, acute, effect on bone formation in rats, 127.
 effect of rates of application and forms on tobacco yield and quality, S.C. 42.
 exchangeable, in soils, determination, 310.
 in cotton plant, 455.
 in fertilizers, 6.
 requirements of calves, Mich. 101.
 requirements of plants, Mass. 729.
- Mahonia swaseyi*, isolation of berberine and berbamine from, 25, 439.
- Maine Station, notes, 865.
- Maine Station, report, 717.
- Malaria—see also Mosquito(es) and Anophelies.
 avian, effect of sulfanilamide and sulapyridine, 529.
 avian, parasites, distribution in visceral organs compared with peripheral blood, 404.
 indigenous, and vectors in Minnesota, Minn. 647.
 parasite in fowls, pathology and effects of experimental conditions, 404.
 parasite, new species from turkey, 827.
- Mallein reaction in Mongolian horses histological changes in, 528.
- Malnutrition—
 extra nutritional determiners of, Me. 691.
 types, Nev. 527.
- Mammals—see also Animal(s) and specific kinds.
 game, regulations relating to, 639.
 of Illinois, check list with keys, 500.
 of Walker Co., Texas, ecological classification, 499.
 small forest, in eastern United States, food of, 783.

- Mammary gland**—
 androsterone effect on, 332.
 effect of stilboestrol on, 391.
 excised bovine, technic for perfusing, 242.
 growth after oestradiol administration to hypophysectomized rats, relation to nutrition, 334.
 growth and involution, effect of applications of turpentine, 335.
 growth in hypophysectomized mice, 39.
 growth in rat, relation to thyroid, 469.
 involution in mice, retardation by injection of lactogenic hormone, 469.
 lactating, use of β -hydroxybutyric acid, glucose, and oxygen by normal and ketosis cow, 519.
 metabolism, specific effect of Ca, Mg, and P, 240.
 smooth muscle elements surrounding alveoli of, 657.
- Man and plants**, textbook, 314.
- Man, vitamin A deficiency in**, consequences and detection, 394.
- Manganese**—
 absorption in fowl, 806.
 in biological material, 698.
 in fertilizers, 6.
 low diet, bone development in rat on, 418.
 low rations, growth on, 382.
 migration in colloidal systems, III. 15.
 salts, absorption by storage tissue, 455.
- Mangels**, fertilizer tests, R.I. 753.
- Mango(es)**—
 effect of injections with extract from necrotic fruit, 370.
 little-leaf, a zinc deficiency, 370.
 powdery mildew, 637.
 variety tests, Hawaii 190.
- Manila hemp**, see Aback.
- Manilabaris oocurbitae* n.g. and n.sp.**, description, 91.
- d*-Mannoheptulose**, metabolism of, 605.
- Manure**—
 conservation of ammonia in, Me. 593.
 effectiveness in preventing K deficiency, Ky. 751.
 residual effect on yield and grading of Havana Seed tobacco, Conn. [New Haven], 759.
 use for Washington soils, Wash. 593.
- Manzanilla poisoning**, 529.
- Mapharsen treatment for blackhead in turkeys**, 255.
- Maple(s)**—
 leaf curl, notes, 78.
Phytophthora cactorum bleeding canker, Mass. 769.
 red and silver, hybridization, 176.
 red and sugar, vegetative propagation, 355.
 syrup, new uses, N.Y. State 153.
 tree, silver, foliage, method for sampling, 485.
 trees, sugar, glaze-damaged, top rot in, 79.
 trees, tumors on, 498.
- Maps**, topographical, recording localities from, method, 451.
- Mares**—
 bacterial flora in endometritis, 529.
 virus abortion of, Ky. 815.
- Marigold roots**, nematodes on, 370.
- Market gardening**, see Truck crop(s).
- Market reports**, U.S.D.A. 687.
- Marketing**, see special products.
- Marshes**, Atlantic coast salt, wildlife of, 639.
- Maruca testulalis***, control, Hawaii 218.
- Maryland Station**, notes, 431, 718, 865.
- Maryland Station**, report, 286.
- Maryland University**, notes, 431, 718, 865.
- Massachusetts College**, notes, 288, 718.
- Massachusetts Station**, notes, 288, 718.
- Massachusetts Station**, report, 864.
- Mastitis**—
 acute, short-wave diathermy plus sulfanilamide for, Idaho 815.
 associated with *Streptococcus dysgalactiae*, 108.
 bacteria, chlorine tolerance, 519.
 cause and control, Idaho 815.
 chronic, effect of novoxil liquid, 534.
 chronic, gramicidin, novoxil, and acriflavine for, 251.
 chronic, treatment, 524.
 contagious streptococcal, possible extension of field control, 400.
 control and treatment, 238.
 control, suggested program, Mich. 253.
 development, relation to changes in chlorine, lactose, and casein number, 660.
 early detection, 525.
 effect of colloidal silver oxide on, 534.
 effect of use of milking machines, 524.
 effect on composition of milk, S.C. 105.
 elimination, 108.
 etiology and value of autogenous bacterins in cure, Md. 243.
 β -hemolytic Lancefield group C streptococcus in, 400.
 β -hemolytic streptococci in, effect of sulfanilamide on, S.C. 105.
 in dairy herds, factors responsible, Wash. 523.
 in heifers, unusual streptococcus in, 107.
 microscopic detection, 108.
 relation to level of ascorbic acid in milk, 101.
 staphylococci, isolation and characteristics of bacteriophages for, 400.
 streptococcal, action of gramicidin on, 250.
 streptococcal, diagnosis, 524.
 streptococcal trypaflavin in infusion therapy for, 108.
 studies, 239, Calif. 104, Kans. 104.
 treatment with acriflavine, 665.
- McCormick, C. H.**, biographical sketch, 121.
- Meadow(s)**—see also Grassland(s) and Pasture(s).
 fescue, see Fescue.
 grass and alfalfa, effect of cultivating and manuring, Wyo. 43.

- Mealybug(s)**—see also *specific host plants*.
Comstock's, control, 86.
Comstock's, injury in orchards, relation to nitrogen ratio, 506
on peaches and apples, S.C. 84
- Melt**—see also *Beef, Pork, etc.*
and bone scrap as protein supplement for fattening pigs, S.C. 92.
animals, farm prices, index numbers, Fla. 677.
canned in glass jars in pressure cooker, heat penetration, 268.
in infant's diet, 413.
packing industry, price and production policies, Iowa 262.
products, imported canned, examination, 411.
products, lactose in, detection and determination, 726.
scrap, free fatty acids and rancidity in, effect on chicks, 93.
sharp-frozen, lower evaporation rate on, Idaho 800.
trends in production and foreign trade for, U.S.D.A. 682.
vitamin B complex in, 132.
- Medical care**—
and sickness of rural population in petroleum-producing area, Ark. 843.
expenditures, urban and farm, U.S.D.A. 284.
- Mediterranean fever**, see *Undulant fever*.
- Megamachus davisii** infesting waterlily in Hawaii, 784.
- Melampsora lini**, life history, N.Dak. 774.
- Melamporella**, aedial hosts, 373.
- Melanophila californica** and *M. gentilis*, biological notes, 237.
- Melanophus**—
botettatus, see *Grasshopper*, two-striped.
differentialis, see *Grasshopper*, differential.
- Melittara dentata**, studies, Kans. 84.
- Melittomma insulare**, pest of coconut in Seychelles, 379.
- Melon (s)**—
Persian, powdery-mildew-resistant, Calif. 49.
storage, 478.
wireworm damage on irrigated land, U.S.D.A. 518.
- Melonworm**, control, Ala. 499.
- Menhaden fishmeal** as protein supplement for fattening pigs, S.C. 92.
- Menodora** root knot, Ariz. 629.
- Merizozites**, avian coccidial infection with, initiation of, 527.
- Merulius lacrymans**, notes, 498.
- Mesovellidae**, notes and descriptions of new species, 790.
- Metabolism**—
apparatus, use of illuminating gas to check, 715.
basal, of college men, Wyo. 122.
basal, of obese children, 126.
of iron, 128.
- Metagonistylum minense**, introduction and establishment in Cuba, 510
- Metals**—
and their alloys, relation to flavor of milk, 304.
in dairy equipment, corrosive effect of chlorine and lye solutions, U.S.D.A. 104.
trace, in biological materials, 698.
- Metaphosphate(s)**—
penetration and availability, in soils, Del. 593.
protein precipitation, studies, 580.
- Metastrongylus elongatus**, notes, 823, 824.
- Meteorological**—
data, Fla. 583, R.I. 729.
observations, 303, 589, Me. 588, Wyo. 13.
results of Byrd Antarctic Expeditions, U.S.D.A. 13.
studies, 729.
- Meteorology**—see also *Climate(s), Rainfall, Temperature(s), Weather, etc.*
forester's dependence on science of, 12.
papers on, 303, 589.
- Methionine** requirements by chicks, 389.
- Methyl bromide**—
as fumigant, 220.
as greenhouse fumigant, effectiveness, Mich. 84.
as mill fumigant, 505.
as nematocide, method of use, 365.
toxicity to red spider and to greenhouse roses, 515.
use in determining susceptibility to fungus infections, 490.
- 2-methyl-1,4-naphthohydroquinone**, vitamin K potency, 139.
- 2-methyl-1,4-naphthoquinone**—
and vitamin K₁, potencies, 427.
derivatives, assays, 574.
- 2-methyl-3-alkyl-naphthoquinone** preparation, method, 440.
- Mice**—see also *Rodent(s)*.
anophthalmic strain, genetics and embryology of, 746.
dwarf, genetically hypopituitary animals, spontaneous diurnal activity in, 604.
effects of gene *W^v* (dominant spotting), 328.
field, control, new method, 788.
hereditary tail abnormality in, 604.
inbred strains, tumors in, 746.
meadow, and owls, N.J. 784.
oestrogen-treated, breaking strength of the femurs of, 38.
- Peromyscus**, correlation and body proportions in, 747.
pregnant, radio-calcium and radio-strontium metabolism in, 416.
short ears in, relation to bifurcated xiphisternum, 328.
treated with thyroxine, changes in skeletal tissues, 467.
X-rayed, fertility in progeny, 329.
- Michigan College**, notes, 718.
- Michigan Station**, notes, 718.
- Michigan Station**, report, 143, 717.

- Microbiology, applied, basic principles of study, 82.
- Micrococci and staphylococci from milk, differentiation, 107.
- Micrococcus* spp. in pasteurized milk, 526.
- Microctonus epitricis*, parasite of tobacco flea beetle, 792.
- Micro-organisms—*see also* Bacteria and Organisms.
- aerobic metabolism, macrorespirometer for study, 296.
 - biochemistry, 453.
 - in Florida soils, types and distribution, Fla. 539.
 - in vitamin research, importance, 741.
 - mode of killing by chemical and physical agents, 248.
 - pollen and insects, air-borne populations of, technics for appraising, 66.
 - saprophytes antagonistic to, 489.
 - soil and plants, interaction, 69.
 - soil, effect of specific agents extracted from, on bacterial infections, 250.
 - specific types, activities in transformation of plant materials, Md. 160.
 - spores and vegetative cells of, staining differentially, solution for, 326.
 - utilization of petroleum fractions, 461.
- Microplectron fuscipennis*, mass production, rearing method for, U.S.D.A. 501.
- Microscope, electron—
- electron optics of, 174.
 - new tool for bacteriological research, 326.
 - properties and achievements, 460.
- Microscopy, fluorescence, value for demonstrating acidfast organisms, 174.
- Microtremes helix* in crows, 82.
- Microtus* and *Peromyscus*, rate of metabolism in, Minn. 640.
- Midge(s)—
- aquatic, chlorinated benzenes for control, 510.
 - reared from pumpkins and squash, Ariz. 641.
- Migrants, characteristics of, 842.
- Migration(s)—
- rural, in selected areas, N.Dak. 842.
 - rural-urban, selective aspects, 841.
- Mildew—*see also* host plants.
- fungicides for, Calif. 65.
- Milk—
- analysis, improved micro-kjeldahl apparatus and procedure for, 520.
 - and fat secretion, effect of fat intake, 382.
 - and fat yield, effect of plane of nutrition during dry period, 99.
 - and storage tissue of cow, vitamin A in, relation to pasture and feeding practices, Ala. 523.
 - and vegetables, comparison of utilization of calcium in, 127.
 - aseptically drawn, diphtheroids isolated from, probable identity, 394.
 - bacterial counts, extent of publicity to public, 661.
 - bacteriological control, 239.
 - boron in, Ky. 852.
 - butterfat and minerals in, correlation, 240.
 - butyric acid bacteria test for, 243.
 - byproducts, utilization, 230.
 - can, proposed new, 524.
 - canned, bacteriology, 239.
 - cans, acidifying, effect on quality, 520.
 - chemical enrichment by administration of diethylstilboestrol and its dipropionate, 810.
 - chocolate, effect of methods of pasteurization, Mass. 809.
 - class I, differentials for, over evaporated code price, 523.
 - clotting enzyme of *Withania coagulans*, 395.
 - composition, effect of mastitis, S.C. 105.
 - composition, factors affecting, Kans. 98.
 - composition, relation to ration, 519.
 - condensed, simplified vacuum solids test, limit of error, 726.
 - containers—
 - glass, new developments in, 523.
 - glass, problems in handling, 523.
 - paper, efficiency and practicability, Mass. 810.
 - paraffined, bacterial contamination, determination, 395.
 - paraffined paper, structural aspects, 394.
 - treated fiber, effect on copper-induced and sunshine oxidized flavors, 521. - contamination with butyric acid bacteria, effect of feed, 242.
 - control in Oregon, economic implications, Oreg. 552.
 - cooked flavor in, cause and prevention, 524.
 - cooling on farm, bacteriological aspects, Pa. 811.
 - cooling systems for farm, 524.
 - cost of production, man labor, returns, etc., La. 829.
 - curd tension, N.Y.State 245.
 - curd tension, determination methods, Mass. 810.
 - curd tension, effect of free fat acids of milk fat, 659.
 - deaeration, design of equipment, angle sanitary fitting in, 659.
 - daily sales, sources and number of producers for Newport market, R.I. 830.
 - delivered to creameries, quality improvement, Idaho 809.
 - diet of dogs, need for cobalt in, 699.
 - distribution costs, effect of single-service container, 524.
 - effect of homogenization, Kans. 98.
 - ejection, factors involved in, 392.
 - energy, conversion of feed energy to, efficiency, 28.
 - evaporated and powdered, vitamin C in, 277.

Milk—Continued.

evaporated, heat stability, effect of flash forewarming, 520.

flavor(s)—

and color, effect of feeding vitamin A and carotene, 394.

and color, factors affecting, Kans. 98

and odors, control by feeding, 394.

defects, application of laboratory findings, 394.

factors affecting, 243, Tenn. 521.

relation to metals and their alloys, 394.

fluid market, extra cost requirements over milk for manufacturing purposes, 523.

foaming, relation to surface-active constituents, 520.

for cheese, testing quality with resazurin and methylene blue, 525.

fresh and canned, competition between, 393.

from individual cows, oxidized flavor in, 521.

from udders with mild streptococcal infections, leucocyte count and chloride in, 525.

gas content, factors affecting, 520.

goat's, composition and properties, Mich. 658.

goat's, thyroprivic, effect on hyperthyroidism, 519.

grading, reductase test v. plate count test, 811.

Guernsey, color inheritance in, 176.

held near freezing point, bacteriological spoilage, 520.

homogenization, determining degree, 238.

homogenized at various pressures, freezing and thawing, 526.

homogenized, studies, 244, 524.

in two market areas, market outlets, comparison, Ohio 548.

instantaneous heat treatment, 658.

iron content, effect of Fe of dairy rations, Mass. 809.

keeping quality, effect of quick freezing, 811.

lactose content, 101.

lipase activity in, inhibition, 525.

market, factors influencing supply in Springfield milkshed, Mass. 830.

market, receipts, transportation, and sources of supply, La. 829.

market, sediment control, 394.

mixer, stainless steel gravity, N.J. 243.

need in South, 270.

oxidized flavor in—

and other flavors, 395, 526.

effect of deaeration, 659.

effect of direct addition of carotene and mixed tocopherols, 520.

new method of retarding, 524.

relation to metals and metallic ions, 243.

pantothenic acid in, 442.

papaya in, experiments with, 811.

Milk—Continued.

pasteurization, effect on *Escherichia coli* in, 658.

pasteurization, time-temperature relations in, 524.

pasteurized, microscopic examination, 393.

pasteurized, thermoduric bacteria in, 394

525.

pasteurizer, small electric, description, 545.

physical properties, effect on rate of digestion in vivo, Iowa 238.

pigments, vitamins, and enzymes, relation to changes in flavor and nutritive value, 524.

plant operation and equipment, effecting economies in, 393.

plants, water conditioning in, 393.

powders, keeping quality and solubility, 239.

powders, spray-dried, bacteriology, 239.

processed and treated, application of phosphatase test, 660.

processing, lighting in, 523.

production—

and body size, 240.

effect of definite time interval for milking cows by machine, N.Y. State 393.

effect of frequency of milking, 519.

effect of glucose feeding, 519.

efficient, dealer-producer cooperation for, 523.

efficient, discussion of symposium on, 523.

input relation to output in, Md. 239.

lowering cost by herd improvement, 523.

not increased by elaborate housing, Wyo. 99.

of beef and dual-purpose breeds of cattle, Fla. 604.

persistency, relation to skeletal reserves of calcium and phosphorus, 519.

persistency and inheritance, Iowa 238.

relation to fat content in grain ration, 519.

supply responses in Wisconsin, U.S.D.A. 684.

trends, 523.

products, dried, riboflavin in, determination, 298, 384.

properties, effect of cottonseed meal feeding, S.C. 98.

properties, stability, 242.

proteins, digestibility, effect of cocoa, 659.

public sales, disease dissemination by, 524.

quality, accurate estimation, modified resazurin test for, 524.

quality control, new medium in, 524.

quality, farm control, 394.

quality improvement without an ordinance, 894.

Milk—Continued.

- quality, possible improvements, 524.
- rancid-flavored, cause and control, 394.
- rate of rennet coagulation, N.Y.State 245.
- resazurin reduction in, 395.
- retailing by producer-distributors in New York State, [N.Y.]Cornell 837.
- riboflavin in, effect of diet, 100.
- sales, fresh, loss to evaporated milk and related farm price policies, 523.
- sampling, preserving. and testing, Oreg. 243.
- sampling, preserving, and testing at milk plants, accuracy, 238.
- secretion, biochemistry, 230.
- secretion, effect of diethylstilboestrol, 519.
- secretion studies, nembutal anesthesia in, 523.
- skimmed, *see* Skim milk.
- soft-curd, production by use of apple products, 520.
- solids, calculation, nomograph for, 811.
- solids, calculation, Sharp and Hart's equation for, 659.
- solids, dry, as bread ingredient, effect on bread consumption, Minn. 717.
- solids, dry, for baking, factors affecting quality, Wash. 521.
- solids-not-fat content, factors affecting, Ariz. 655.
- specific gravity, 101.
- standard plate count, effect of *Streptococcus agalactiae* on, 520.
- standardizing with homogenized cream, improvement in cream layer depth, Idaho 809.
- substitutes for feeding chicks, Wis. 516.
- supplies, laboratory examination, simplified procedure, 661.
- supply, uniform high quality, establishment, 524.
- thermoduric bacteria in, 520.
- treated by base exchange for infant feeding, 502.
- two and four quart bottles for, distribution costs, 523.
- ultraviolet rays applied to, lethal effectiveness, 520.
- vitamin A in from legumes and grasses, Idaho 809.
- vitamin C in, relation to oxidized flavor, 394.
- vitamin D in, review, 660.
- vitamin D potency, effect of exposure of cows to sunlight, Ariz. 694.
- weedy flavors, papers on, 394.
- yearly records, calculating methods, 393.
- yield and fat content of lowland breeds, 240.
- yield, fat percentage, and energy, correlation, 242.
- yield of dairy cows, causes of variation in, 392.

Milk—Continued.

- yields, relation to quantity and composition of rations in controlled herds, 99.
- Milking—
 - efficient, factors involved in, 392.
 - machines—
 - care of, 658.
 - operation and effect on production and mastitis, 524.
 - teat cup solution rack, Mich. 676.
 - use of timer on, N.Y.State 810.
 - value of definite time interval in use, N.Y.State 393.
 - methods, comparison, 242.
- Mill fumigant, methyl bromide as, 505.
- Millet—
 - fertilizer tests, R.I. 753.
 - foxtail, vegetative growing points, studies, 43.
 - German, yields and P in, effect of six P carriers and previous fertilizer treatments, Tenn. 471.
 - Japanese, residual effects from different levels of fertilizer, R.I. 753.
 - Japanese, value for silage, R.I. 810.
 - pearl, strain tests, Fla. 609.
 - variety tests, N.Mex. 183, Wyo. 43.
- Milo, *Pythium* root rot, U.S.D.A. 183.
- Mimosa—
 - tree *Fusarium* wilt, 638.
 - wilt, further distribution, U.S.D.A. 628.
- Mincola vaccinii*, *see* Cranberry fruitworm.
- Mineral(s)—
 - absorption by plants, relation to lignin, Mass. 724.
 - constituents, water-soluble, of plant ash, micro determination, 444.
 - deficiency(ies)—
 - and excesses in plants, diagnosis, 357.
 - and vitamin deficiency, nonidentity of gray hair produced by, 423.
 - in cattle, effect on reproductive activity and disease resistance, Nev. 527.
 - for farm animals, Oreg. 801.
 - hunger in livestock, 93.
 - in poultry nutrition, 389.
- Mink(s)—
 - amyloid deposits in, 672.
 - kit, flesh fly fatal to, 502.
 - ranch-raised, three coat color mutations in, inheritance, 747.
- Minnesota Station, notes, 144.
- Minnesota Station, report, 717.
- Minnesota University, notes, 144.
- Minnow, fat-headed, valuable forage fish in lakes and streams, N.Dak. 83.
- Mirax coptodiscus* n.sp., description, 649.
- Mississippi Station, notes, 288, 865.
- Mississippi Station, report, 864.
- Mite(s)—
 - control, 217.
 - in nasal passages and sinuses of dogs, 527.
 - new parasitic, from South Africa, 85.

- Mite(s)—Continued.
 new spinning, on strawberry, 92.
 on potato seed pieces, Fla. 642.
 on poultry, control, Calif. 83.
 on raspberries, control, Mich. 84.
 orchard, new method of counting, 502.
 Pacific and European red, on apples, 230.
 Mitosis in pollen tubes, mechanism, 326.
- Mocis repanda*, enemy of rice in Costa Rica, 646.
- Molasses—
 beet, as supplement to native hay, Wyo. 99.
 feeding value for livestock, La. 801.
 grass, analyses and digestibility, Hawaii 231.
- Mold(s)—
 control in brewery, modern fungicide paints for, 359.
 control, new developments in, 394.
 mycelia in butter, 394, Ind. 103.
 mycelia in cream, 394, 812, Ind. 103.
 mycelia in cream and effect of udder infection on test for, 521.
 of significance in dairying, gas requirements, Wash. 521.
 toxic action of germicides, ability to overcome, 359.
 white, on flower and bulb crop of narcissus, effect, 370.
- Molybdenum—
 deficiencies in crops, symptoms and diagnosis, 60.
 deficiencies of fruit seedlings, water culture experiments, 773.
 essential nature for plant growth, 454.
- Monilema annulata*, notes, Colo. 512.
Monilia costalis, notes, Ariz. 641.
Monilia expansa, phenothiazine v. copper-nicotine solution for, 669.
Monochamus scutellatus, see White-spotted sawyer.
- Monilema annulatum*, notes, Kans. 84.
- Montmorillonite for organic cations, base exchange, 437.
- Moonlight, effect on photosynthesis in fresh water algae, 324.
- Mosquito(es)—see also *Anopheles*, Malaria, and Yellow fever.
 abatement district, problems in starting, 647.
 Control Association, California, proceedings and papers, 647.
 control work, Del. 84.
 density, ground level v. 100 feet elevation, 509.
 Greek, egg production, 510.
 increasing toxicity of pyrethrum against, 509.
 infesting deep shelters in London, 377.
 larvae nutrition, 508.
 larvae treated with antimalarial oils, 378.
 larvicide, copper sulfate for, 226.
 salt-marsh, eggs, hatching response, 503.
 studies, Iowa 218.
- Mosquito(es)—Continued.
 transmission experiments of fowl spirochaetosis with, 326.
 transmission of anaplasmosis by, 815.
- Mosses, physiological studies, 169.
- Moth proofing tests of fabrics, 377.
- Motor trucks, farm, cost of operation, [N.Y.] Cornell 260.
- Muck—
 crops, irrigation, evaporation index in timing, Ohio 479.
 crops, nutrition of, 592.
 soils, fertilizer requirements, Mich. 22.
 structural characteristics, 446.
- Mulching, value in prevention of boron deficiency, Wis. 488.
- Mule(s)—
 colts, growth, effect of pasture fertilization, 381.
 work, economical rations for, Miss. 383.
 work, response to lespedeza hay, Miss. 383.
- Mullein leaf bug control, in Nova Scotia apple orchards, 786.
- Muticops serialis*, evagination of larvae, use of bile salts for, 500.
- Mundula sericea*, Indian strain, insecticidal properties, 641.
- Mung beans—
 breeding, noteworthy results, Calif. 40.
 variety tests, N.Mex. 183, 753.
- Murgantia histrionica*, see Harlequin bug.
- Musca domestica*, see Housefly.
- Muscina stabulans*, see Stablefly, false.
- Muscular dystrophy, treatment with vitamin E, 426.
- Mushroom(s)—
 compost, preparation, 620.
 growing in United States, U.S.D.A. 620.
 pantothenic acid in, 442.
- Muskmelon(s)—
 breeding, Ariz. 190, 619, S.C. 48.
 breeding for better quality and disease resistance, Md. 191.
 copper dusts for, Mass. 769.
 downy mildew, effect of fungicidal dusts in seasons of low incidence, 768.
 fertilization, Iowa 190.
 fruit characters, correlation studies, 347.
 fruit setting in, effect of indoleacetic acid, 347.
Fusarium wilt, Md. 205.
 hill spacing, S.C. 48.
 mildew-resistant, breeding, Calif. 49.
 polysomaty in, 463.
 Powdery Mildew Resistant No. 45, yields, effect of spacing, 346.
 quality, refractive index as estimate, 50.
 spraying and dusting, Md. 191.
 tetraploidy in, acenaphthene-induced, 463.
 varieties, new, Calif. 192.
 variety tests, Iowa 190, S.C. 48.
- Muskat, ecology, Iowa 217.
- Musella pectinicornella*, notes, 86.
- Mutillidae, type locality for two species, correction of, Minn. 648.

- Mycetophilidae of Iowa, list, 641.
- Mycobacterium paratuberculosis*, tuberculin reactions in cattle infected with, 821.
- Mycology, basic principles of study, 32.
- Mycorhiza, role in nutrition of forest seedlings, Wis. 485.
- Mycorrhizae—
additions to literature of, 24.
and mycorrhizal fungi of coniferous plantations, 498.
- Mycosphaerella*—
fragariae, sprays for and nature of resistance to, La. 769.
louisianae n.sp., notes, 77.
louisianae, notes, La. 769.
musicola n.sp., description, 368.
populicola n.sp., description, 81.
populorum n.sp., description, 81.
- Myiasis—
cutaneous, in box turtle, 83.
of wild animals in Manchoukuo, 528.
- Myopa* sp., parasite of bees, 88.
- Myriapods and insects, embryology of, 83.
- Myriogenospora aciculisporeae* on sugarcane in Louisiana, 495.
- Myrsidea interruptata* in crows, 82.
- Myxobacteria, biology, 32.
- Myzus—
cerasi, see Cherry aphid, black.
circumflexus, feeding habits and penetration rates, 376.
persicae, see Peach aphid, green.
persicae, vector of cucumber mosaic virus on red pepper, 362.
scammelli, notes, 643, Mass. 786.
- Naphthohydroquinone derivatives, vitamin K activity, 713.
- Naphthoquinones, vitamin K activity, 139.
- β -Naphthoxyacetic acid formative effects in plants induced with, 740.
- Naphthylacetic acid, effect on rooting of plant cuttings, 318.
- Napier grass—
breeding, Fla. 608.
for pastures, studies, Fla. 609.
improvement and management, Hawaii 181.
leaf spot, Hawaii 204.
strain tests, Fla. 609.
v. other grasses, Hawaii 238.
whole v. cut, Hawaii 238.
- Narcissus—
bulb fumigation, Fla. 619.
bulb treatments for *Ditylenchus dipsaci*, results, 781.
diseases, 215.
leaf diseases, control, 370.
paperwhite, Fla. 200.
- Naval stores of south Georgia and future outlook, U.S.D.A. 62.
- Nebraska Station, notes, 431, 719
- Nebraska University, notes, 431, 719
- Nectar secretion, 380.
- Nectria*—
canker of northeastern hardwoods, relation to stand improvement, 78.
- Nectria*—Continued.
coccinea, association with *Gonatorrhodella niglei* in United States, 372.
- Neisseria oattarrhals* as index of pollution in swimming-pool water, Mass. 724.
- Nematode(s)—see also Root knot nematode.
ability to induce root knot, local differences in, Tenn. 487.
bulb, transfer from *Tropaeolum polyphyllum* to potatoes, 211.
bursate, vertical migrations of infective larvae, 818.
in partridge and pheasant, 82.
in root tissue, staining, 364.
in ruffed grouse, 405.
infection in sheep, low-plane, epidemiology, 823.
parasites of poultry, epidemiology, and interhost relations, Ala. 539.
resistance of poultry to, Kans. 104.
- Nematodirus*—
filicollis, phenothiazine v. copper-nicotine solution for, 669.
sp. in sheep, Va. 669.
- Neodiprion*—
americanum, life history studies, 799.
tsugae, see Hemlock sawfly.
- Nephantis serripes* control, 515.
- Nephotettia apicalis cincticeps*, relation to dwarf disease of rice, 643.
- Nephrotoma tenuis* in nesting tunnel of *Crabro maculipennis*, 380.
- Neuralgia, facial, effect of large doses of vitamin B₁ and liver extract, 568.
- Neuritis, arsenic peripheral treatment with vitamin B₁ and α -tocopherol, 138.
- Nevada Station, report, 575.
- New Mexico College, notes, 865.
- New Mexico Station, notes, 865.
- New Mexico Station, report, 286.
- New York State Station, notes, 719.
- Newcastle disease of fowls, immunization against, 114.
- Nezara viridula*, see Stinkbug, southern green.
- Nicotiana*—
rustica, origin of, 462.
rustica wildfire, control, 74.
tabacum phloem, effect of curly top disease, 64.
- Nicotine—
color reaction, characteristics, 299.
compounds, toxicity to bean aphid, 221.
in fresh tobacco leaf, determination, 298.
sprays in apple schedule, 788.
sprays, rosin residue as spreader for, 504.
turbidimetric determination as phosphotungstate, 298.
- Nicotinic acid—
bibliography of, 702
curative action in dogs, effect of sulapyridine, 388.
derivative in human urine, hitherto unrecognized, 702.
effect on growth and yield of oats and tomatoes, 599.

Nicotinic acid—Continued.

- failure to improve growth of excised tomato roots, 818.
- in animal tissues, blood, and food, estimation, 858.
- in biological materials, determination, 584.
- in peanuts and products, Ga. 728.
- in urine, determination method, 442, 859.
- metabolism and dispensability in sheep, 382.
- synthesis of factor V from, by erythrocytes, 859.
- treatment for trench mouth, 424.

Nidicola marginata n.g. and n.sp., notes, 790.

Nitrification—

- in soils containing plant residues of high lignin content, Mass. 729.
- of fertilizer materials, Conn [New Haven] 759.

Nitrogen—

- conservation studies, Tenn. 445.
- economy in different systems of soil and crop management, Ala. 445.
- excretion by inoculated legumes, factors affecting, 735.
- fixation—
 - biochemical, studies, 317.
 - biological, 317.
 - by *Azotobacter chroococcum*, effect of protozoa, 166.
 - by *Azotobacter*, hydrogen inhibition of, 734.
 - in legumes, 452.
 - symbiotic, biochemistry, 25.
 - symbiotic, mechanism, 25.
 - symbiotic, respiratory enzyme systems in, 452.
- fixing organisms, effect on plant growth and nitrogen balance, Kans. 13.
- from Urea-Ammonia Liquor—37, value, 736.
- in plant tissues, chlorate method, determination of ammonia and amide nitrogen in, 5.
- in soil, effect of green manure (crop management on Norfolk sand, 338.
- losses from dry-farm soil, 16.
- metabolism of plants, role of vitamin C in, 169.
- mineralizable, in soils, Hawaii 160.
- relations and land use, 449.

Nitrogenous—

- compounds, diffusion from legume nodules or roots, 316.
 - factors, anticataractogenic action of, 272.
 - fertilizers, effect on nitrogen content of cured tobacco leaves, Conn.[New Haven], 759.
 - fertilizers, efficiency and economy of on tomatoes on sandy soils, Fla. 589.
 - fertilizers for western Washington soils, comparison, West.Wash. 446.
- Nodita virginica*, studies, 224.

Nodule bacteria—*see also* Legume(s), inoculation.

- growth, effect of pH and copper, 317.
- nitrogen content, 317.
- value of different amino acids as nitrogen sources, 317.

Nomograph for correction of lactometer readings and calculation of milk solids, 811.

Nomophila noctuella, studies, Kans. 84.

North Carolina College, notes, 432, 865.

North Carolina Station, notes, 432, 865.

North Dakota College, notes, 719.

Novoxil for treatment of chronic mastitis, 251.

Nucleoli, staining, new method, 326.

Nurse crops, comparison for alfalfa timothy mixtures, Wis. 472.

Nursery—

- stock, use and production, Wash. 477.
- trees, newly planted, spraying with wax emulsions, Kans. 48.

Nut(s)—

- boron in, Ky. 852.
- chemical composition, 724.
- composition and energy value, 691.
- diseases, 635.
- of *Juglans* and *Carya*, lacunae or cavities in, 170.
- phenological studies, N.Mex. 191.
- situation and outlook for, Calif. 682.
- storage, U.S.D.A. 411.
- variety tests, West.Wash. 478.

Nutgrass—

- control, Ariz. 608.
- in cotton soil of Gezira, 343.

Nutrient deficiencies of soils, status of greenhouse investigations, Iowa 160.

Nutrient media, *see* Culture media.

Nutrition—*see also* Diet(s).

- and defense, 844.
- and the war, 270.
- animal, *see* Animal nutrition.
- as it relates to eyes, 694.
- Conference, National, for defense and significance of experiment stations, editorial, 1.
- human, panthothenic acid in, 133.
- level, assessment of, 571.
- plant, *see* Plant nutrition.
- role of wheat minerals in, 851.
- study from soil through plants and to man, 356.
- vitamin B complex in, 132, 566.

Nutritional diseases in United States, 563.

Nutritive equivalents, partial, measurement, 382.

Nylon, descriptions and photomicrographs, 141.

Nystus nemorivagus, studies, Hawaii 218.

Oak(s)—

- Appalachian, prediction of cull following fire, 372.
- diseases, 372.
- new species from Georgia, 170, 171.
- of trans-Pecos Texas, 171.
- posts, untreated, durability in Southwest, 767.

Oak(s)—Continued.

top rot, external features correlate with, 79
very old bur, growth ring study, 325.

Oat(s)—

Bond crosses, performance of, 174
boron in, Ky. 852.
breeding, Fla. 608, Idaho 751, Iowa 182, Kans. 40, Tenn. 470.
breeding for disease resistance in, Kans. 65.
chop sifter, description, 408.
coleoptile—
correlation curvature in, 26.
growth rate, dependence on previous auxin supply, 819.
growth, relation to respiration, 322.
covered smut, infection studies, 69.
crown rust, breeding for resistance to, 174.
culture experiments, Kans. 40.
diseases, estimated reduction in yield from, U.S.D.A. 769.
diseases, studies, Iowa 205, Kans. 65.
downy mildew, 768.
fallow methods for, Kans. 753.
fertilizer tests, Fla. 609, Miss. 337, [N.Y.] Cornell 609, S.C. 42, Tenn. 471
flour, antioxygenic fraction in, 101.
in rotation, effect of tillage and green manure, Wyo. 43.
in sand culture, growth and yield, effect of vitamin B₁ and nicotinic acid, 599.
leaf rust, in North Dakota, N.Dak. 771
manure and fertilizer tests, Wash. 593.
Marida, merits of, Idaho 751.
Miomark, studies, S.Dak. 757.
puffed, flour, antioxidative properties when added to milk, Mass. 810.
respiration, protoplasmic streaming and transport in, effect of temperature, 169.
rusts, early spring incidence in Texas. U.S.D.A. 204.
rusts, studies, Iowa 205.
rye, wheat, and barley, comparison of yields, Tenn. 470.
seedlings, growth, relation to four-carbon acids, 599.
smut(s)—
breeding for resistance to, 174.
hybridization, cytology, and sexuality, 491.
resistance in hybrids, inheritance of, 746.
studies, Iowa 205, Wash. 487.
susceptibility of different lots of varieties to, 632.
sprouted, Cebione, and orange juice as source of crystalline ascorbic acid, Kans. 126.
stem rust, breeding for resistance to, 174
stem rust in variety nursery of Wyoming Experiment Station, U.S.D.A. 64.
straw, increasing feeding value, 651.

Oat(s)—Continued.

take-all or whiteheads, in Walco, cause, 70.

Uton, new high-yielding smut-resistant, Utah 341.

variety tests, Ala. 470, Ariz. 181, 608, Fla. 608, Idaho 751, Ind. 751, Iowa 182, Kans. 40, Me. 609, Mass. 337, N.Mex. 183, 753, S.C. 42, Tenn. 470, Wash. 471, West.Wash. 471, Wyo. 43.
Vieland, seeding and variety tests, Wis. 472.

yields—

effect of bindweed, Kans. 41.
effect of shelterbelt, Wyo. 43.
effect of storage of treated seed, Ill. 360.
increase from top dressing with nitrogen, Miss. 336.
notes, N.Dak. 42.

Oatgrass, tall, vegetative growing points, studies, 43.

Obstetrics, veterinary, 397.

Ochrosidia susceptibility to infection by type A milky disease, 512.

Oecanthus niveus, see Cricket, snowy tree.

Oesophagostomum—

columbianum in sheep, Va. 669.
columbianum, treatment with repeated doses of phenothiazine, 536.
radiatum in calves with tropical diarrhea, P.R. 821.

Oestradiol benzoate pellets, absorption and effects on rats, 333.

Oestrogen(s)—

administration to hens, precocious sexual maturity after, 603.
and androgens, antagonism between, 180.
assay, mouse uterine weight method for, 606.
effect on blood serum and skeletal changes in breeds of ducks, 332.
effect on pituitary and mammary gland, 332.
effect on reproductive tract of spayed ewes, 332.
in urine of normal and vitamin E depleted rats, 181.
naturally occurring in rat uterus and vagina, comparative activity, 180.
secretion, production, synergism of follicle stimulating and luteinizing hormones in, 333.
synthetic, 606.
treated mice, breaking strength of femurs of, 33.

Oestrone—

pellets, absorption and effects on rats, 333.
response of inbred mice to, 334.

Oestrus oris, see Botfly, sheep.

Office of Experiment Stations, notes, 283.

Ohio Station, notes, 719.

Odium mildew of rubber trees, control methods, 73.

Oil(s)—*see also* Fat(s) and *specific oils*.

- and fats for cooking and table use, U.S.D.A. 122.
- associations, cooperative, organization and operation, Minn. 839.
- containing vitamin A, local action, 699.
- injury to woodlands, 788.
- sprays, new facts about, 375.
- sticking qualities, Mich. 84.
- vegetable, nutritive value, effect of added egg phospholipids, 413.
- vegetable, smoke, flash, and fire points of, 157.
- vegetable, stability, 294.
- vitamin A in, spectrophotometric and biological assay, 441.
- Okra breeding, La. 761.
- Okra fruit, growth and composition, relation to eating quality, U.S.D.A. 50.
- Old age assistance in Iowa, Iowa 265.
- Older people, vitamin requirements, Mass. 845.
- Oleander witches'-broom, Fla. 619.

Olive(s)—

- and olive products in Egypt and Italy, 155.
- coliform bacteria from, characteristics, 370.
- knot, studies, 77.
- pickling, color control in, role of salts, 299.
- products, Calif. 5.
- ripe, freezing storage, experiments, 299.
- Spanish-type, floral changes in fermentation, 33.

Omphala root rot, proposed term for date palm decline disease, 77.

Onchocerca cervipedis, parasite of deer, 536.

Onion(s)—

- breeding, Iowa 190.
- bulb nematode, survival in New York, U.S.D.A. 768.
- carbohydrates in, effect of storage and processing, Mass. 724.
- chiasma formation, dependence on temperature, 459.
- diseases in Iowa, Iowa 205.
- downy mildew, U.S.D.A. 628.
- downy mildew infections, sporulation injury associated with, 771.
- fertilizer tests, R.I. 753, Tex. 51.
- fly, black and brown, studies, Iowa 218.
- garlic rust infection, U.S.D.A. 204.
- maggot, studies, Iowa 218.
- mild flavor in, factors determining, R.I. 762.
- mirid, studies, Iowa 218.
- New Mexico, market outlets for, N.Mex. 836.
- number and length of roots, effect of growth substances, 480.
- pink root and associated bulb rot and false blight, N.Mex. 205.
- pungency, factors affecting, 620.
- thrips, control, Idaho 786, Mass. 786.
- thrips, pest of greenhouse carnations, Wash. 503.

Onion(s)—Continued.

- thrips, studies, Fla. 641, Iowa 218.
- varieties, Wis. 478.
- varieties, new, Calif. 192.
- variety tests, N.Mex. 191.
- White Grano, effect of irrigation, N.Mex. 763.
- White Grano, improvement and irrigation, N.Mex. 191.
- wireworm damage on irrigated land, U.S.D.A. 513.
- yellow dwarf, studies, Iowa 205.
- yields and shrinkage in storage, factors affecting, Mass. 769.
- Ophiobolus graminis*—
- avenae* n.var. in Wales, 70.
- in wheat soil, effect of organic matter additions, 208.
- survival in infected wheat stubble buried in soil, 208.
- Ophiola* sp., notes, 643, Mass. 786.
- Ophthalmia, periodic—
- of horses and mules, Md. 248.
- possible relation to brucellosis, 817.
- studies, Ky. 815.
- Ophthalmology in Equidae, 111.
- Optus ilicis* n.sp., biology and postembryonic development, 798.
- Opossum, sex differentiation in, role of sex hormones, 331.
- Orange(s)—
- ascomycete affecting in Brazil, 369.
- behavior in storage, effect of oiled citrus wraps, 479.
- black spot due to *Phoma citricarpa*, 369.
- boron in, Ky. 852.
- demand and prices, Calif. 117.
- Florida, ascorbic acid in, 134.
- Florida, juice, carotenoid pigments and other constituents, U.S.D.A. 154.
- Florida, seasonal changes in, U.S.D.A. 58.
- from Rio Grande Valley, ascorbic acid in, variations in, 709.
- groves, frenched and bronzed, vitamin C in fruit, effect of Zn and Mg deficiency, 369.
- groves, midseason, costs, returns, production, etc., Fla. 677.
- juice, Cebione, and sprouted oats as source of crystalline ascorbic acid, Kans. 126.
- marmalade, new method of making, Mass. 724.
- navel, effect of repacking on spread of *Penicillium digitatum*, 479.
- navel, water rot, relation to rainfall and oil sprays, 498.
- oil, commercial production in Florida, 154.
- root rot, cause, 77.
- satsuma, fertilizers for, La. 761.
- seedlings, Valencia, anatomical responses to changes in chloride and pH, 169.
- tortrix, control, Calif. 83.
- trees, growth, effect of organic matter and growth substances, 623.

Orange(s)—Continued.

Valencia, granulation, Calif. 65, 369.

Valencia, variability of sugar-acid ratio and total nitrogen in, 198.

vitamin C in, 705.

water spot of, Calif. 65.

Orchard(s)—see also Fruit(s), Apple(s) Peach(es), etc.

cover crop studies, 481, Wash. 477.

fertilization and irrigation, Wash. 477.

grass-alfalfa mixtures for hay, West. Wash. 471.

grass, breeding, Ky. 751.

grass, perosis-preventive properties, Idaho 815.

grass, proliferation in, R. I. 753.

grass, strain tests, Mass. 752.

grass, vegetative growing points, studies. 48.

heating experiments, Calif. 115.

home, planting and management, Miss. 52.

insect pests of 1938, 640.

pest control, 86.

sanitation and practices, 375.

snail control in, 374.

soil, frost penetration in, effect of ground cover, Kans. 48.

soil management for apples, Kans. 47.

soil toxicity, relation to small fruit and truck crop production, Wash. 477.

trees, frost damage, U.S.D.A. 357.

Orchid diseases, 78.

Orchids, culture, U.S.D.A. 61.

Orchitis in bull, 820.

Organic—

acids, preservative values of, Mass. 724.

compounds, molecular structure, electro-

kinetics as tool for study, 580.

materials, translocation in plants, sig-

nificance of phloem exudate, 454.

matter—

added to lysimeters of Norfolk coarse sand, effects, 165.

additions, effect on crop yield, Idaho 729.

decomposition and effect on soil, Fla. 589.

exchange capacity, quantitative estimation, 488.

in eastern Washington soils, maintenance, Wash. 445.

in soil and ion availability for plants, 736.

in soil, effect of green manure crop management on Norfolk sand, 338.

in soil, effect on run-off and erosion, S.C. 13.

in soil, origin and nature, 591.

in soil, oxidation with hypiodite, 438.

losses from dry-farm soil, 16.

substances as insecticides, natural and synthetic, 219.

Oriental beetle, susceptibility to infection by type A milky disease, 512.

Ortola, bullock, insect food of, 784.

Ornamental plants, shrubs, and trees, see Plant(s), Shrub(s), and Tree(s).

Ornithine, dissociation, effects of salts on, 439.

Ornithocoris toledoi, biology, 87.

Ornithodoros—

concanensis n.sp., from bats, 640.

eremicus n.sp., from white-footed mouse, 381.

kelleyi, n.sp., from bats, 640.

spp., transmission experiments, 826.

stageri, n.sp., from bats, 381.

vigueraei, new species from bats in Cuba, 381.

yumatensis n.sp., from bats, 381.

Orobancha ramosa infection on tobacco, 74.

Orphulella genus, revision, 87.

Orthodichlorobenzene and naphthalene mixture applied by new method, fumigating action, 220.

Oscinella, new North American species, Mich. 227.

Osmotic concentration and cell permeability, 743.

Osteomalacia, potency of vitamins D₂ and D₃ in, 711.

Ostertagia—

circuncincta in sheep, Va. 669.

phenothiazine v. copper-nicotine solution for, 669.

Ova in cattle, artificially matured and ovulated, potential fertility, 327.

Ova of mice, implantation studies, 334.

Ovarian extracts, residual, histological effects on rats, 750.

Ovary (ies)—

androgenic, in rat produced by postnatal injections of oestrogen, 604.

grafted in ears of castrated male mice, fate of, 334.

of guinea pigs, proliferation and oogenesis in germinal epithelium of, 468.

of normal and hormone-injected young rats, replacement of ovocytes in, 468.

rabbit, germ cells of, from sex differentiation to maturity, 750.

rat, changes in follicular apparatus during pregnancy, 180.

residual, fractionation study, 333.

Ovogenesis rhythms before sexual maturity in rat and cat, 333.

Ovulation, time of in cattle, 239.

Owl(s)—

and hawk pellet formation and identification, 499.

of New Jersey, N.J. 783.

western burrowing, transmission of equine encephalomyelitis virus to, 403.

Oxygen—

atmospheric, origin, 588.

evolution in photosynthesis of *Blodden canadensis*, apparatus for determination, 456.

Oxyptilus perlaecidactylus, see Grape plume moth.

Oxyuris, effect of phenothiazine on, 403.

Oysters, pantothenic acid in, 442.

- Pacific mite on grapes, control, Calif. 83.
- Paints, modern, for mold control in brewery, 359.
- Palm-kernel oil—
of *Cocos oilifera*, 201.
vitamin A content, 420.
- Palms—
shoot apices in, structure, 168.
Washington, *Phytophthora* bud rot, Ariz 628.
- Panicum*—
demissum, new smut on, 490.
smut, fall, two types, 210.
virgatum collections, differences in plant type and rust reaction, 341.
- Pantomorus leucoloma*, see White-fringed beetle.
- Pantothenic acid—
and nutritional achromotrichia in rats, 134.
annotated bibliography, 704.
assay method, 442.
crystalline derivative, isolation, 440.
curative effect on adrenal necrosis, 422.
diphosphate, 704.
distribution in products of natural origin, 857.
effect on histopathology of filtrate factor deficiency state in rats, 276.
effect on respiratory activity, 319.
essential nature in nutrition of dog, 387.
in eggs, effect of diet, 235.
in human nutrition, 133.
in rumen content of livestock fed vitamin-low diets, 394.
physiological activity and clinical use, 704.
structure, 440.
synthetic, biological activity, 440.
synthetic, effect on adrenal hemorrhage, atrophy, and necrosis in rats, 276, 277.
- Papadopis purpurifascia*, see Columbine borer.
- Papaya—
catalase activity, effect of vapor heat treatment, Hawaii 190.
changes in during ripening, and effects of cold storage, 484.
diseases, Fla. 629.
fruits, methyl bromide fumigation, Hawaii 190.
insects destructive to, Hawaii 218.
juice in milk, experiments with, 811.
respiration, effect of relative humidity, Hawaii 190.
sex determination in genetics, Hawaii 190.
virus disease and fruit and stem rot, Hawaii 204.
- Paper
and paperboard used in food packaging, microbiology, 558, 693.
milk bottle, efficiency and practicability, Mass. 810.
- Papulaspora gladioli*, studies, 638.
- Paraffin—
blocks, improved trimmer for, 325.
germicidal properties, 156.
sectioning, cooling method in, 325.
- Paralysis—
fowl, etiology, Fla. 665.
fowl, inheritance of resistance to, Ala. 464.
fowl, reduced virulence of, Idaho 815.
fowl, studies, 673, Kans. 104, Wyo. 105.
fowl, wheat germ oil for control, 864.
infectious bulbar—
in Minas Geraes, Brazil, 399.
outbreak, 109.
of vitamin E-deficient rats, 712.
range, in poultry, etiology, Iowa 247.
- Paraneotria carrisana* n.sp. on coffee leaves, 66.
- Parascaris equorum*, effect of phenothiazine on, 403.
- Parasite(s)—
and disease in ruffed grouse, 405.
animal, studies, Kans. 104.
control, principles, 106.
ova in feces, detection, flotation solutions for, 105.
- Paratetranychus*—
citri, see Red mite, citrus.
coitti n.sp. in California, 381.
ficis, injurious to trees and shrubs in California, 650.
pilosus, see Red mite, European.
yotherst, see Red mite, avocado.
- Paratrichia cockerella*, see Tomato psyllid.
- Paratuberculosis, see Johne's disease.
- Paratyphoid—
bacilli, Ky. 815.
in a fawn, 823.
in chinchillas, Idaho 815.
- Parental behavior, adolescents' dislikes regarding, 267.
- Paris green, composition, variations in, 785.
- Parkia speciosa*, insect pests, 86.
- Parlatoria ohnensis*, recently discovered in United States, U.S.D.A. 502.
- Partridges—
helminths and coccidia in, 82.
Hungarian and Chukar, in Pennsylvania, 500.
ulcerative enteritis in, Mo. 256.
- Paspalum notatum* seeds, germination, 169.
- Pasteurella*—
accessory growth factor requirements, 398.
ovoides injection by several routes, 106.
sp. in brain tissue of turkeys, 827.
spp., accessory growth factor requirements, 818.
- Pasteurization—see also Milk.
Electropure and vat methods, comparison, Mass. 810.
refrigeration used with, 398.
short time high temperature, problems, 520.
- Pasteurizers, electric, 521, Md. 257.

Pasture(s)—*see also* Grass(es), Grassland(s), and Meadow(s).

- carpet grass, clovers in, S.C. 42.
- crops, growth characteristics, Mich. 184.
- crops, temporary, carrying capacity, Kans. 98.
- delta, building, Miss. 333.
- dry-land experiments, Mont. 473.
- effect and economy of heavy initial fertilizer treatments, S.C. 43.
- effect of fertilizers and grazing, Iowa 160.
- effect of fertilizers on fertility and grass population, Md. 182.
- experiments, Miss. 336.
- fertilization, results, La. 810.
- fertilized Coastal Plains, beef-producing capacities, S.C. 93.
- fertilizer tests, Idaho 751, Ind. 751, Ky. 751, Miss. 336.
- for dairy cattle, cost, efficiency, and management, Oreg. 832.
- for steers, fertilizer treatment, Ky. 801.
- grasses, *see* Grass(es).
- grasses and crops for, adaptation, Ariz. 651.
- herbage and botanical composition, effect of fertilizers and lime, Va. 611.
- improvement, Fla. 609, Iowa 182, La. 752, Md. 182.
- in limestone area, economy, Ind. 831.
- irrigated, carrying capacity, nitrogen fertilizer for increasing, Idaho 809.
- irrigated farm, cost and efficiency, Oreg. 832.
- irrigation, feasibility, Tenn. 521.
- management in Appomattox Co., Va. 611.
- mixtures, variety tests, Idaho 751, Wyo. 43.
- native, use for steers and heifers, Kans. 92.
- of various types, yields and grazing days from, Wis. 522.
- of Willamette Valley, costs and grazing values, Oreg. 832.
- on red clay, improvement, Wis. 471.
- on sandy lands, special management, Wis. 471.
- permanent, establishment, Fla. 609.
- plants and pastures of New Zealand, 337.
- plants, flowering and seed production, Md. 182.
- plants, root development and deterioration under different treatments, Fla. 609.
- productivity, erosion, and run-off from, effect of soil treatment and grazing, 337.
- rations alone, nutritive value, 391.
- seeding and management, Nebr. 44.
- soils, movement of lime in, Mass. 729.
- species, introduction and evaluation, Hawaii 181.
- studies, Ark. 472, Fla. 609, Kans. 41, La. 752, Wyo. 43.
- studies, availability and use of potassium, 594.

Pasture(s)—Continued.

- supplementary, comparison of herbage for, R.I. 753.
- value of liquid manure for, West.Wash. 521.
- yields, calculating with dairy heifers, 519.

Patents relating to pest control, U.S.D.A. 219.

Pea(s)—

- airplane dusting, experiments, Wis. 503.
- Alaska, nutritive value of protein plus *D*-valine, 384.
- Alaska, on soils of known fertility, effect of N, P, and K, 347.
- Alaska, tenderometer readings and alcohol insoluble solids in, relation, 192.
- aphid—
 - control, 375, Oreg. 701.
 - development, reproduction, and longevity, effect of aphid resistance in peas, 701.
 - injury, resistance of red clover to, Ky. 645, 786.
 - insecticides, field experiments, Wis. 503.
 - population of 1940 and migration, Wis. 503.
 - populations, method and contrivance for sampling, 790.
 - sprays for, Md. 219.
 - studies, Me. 642.

Austrian Winter—

- for cover crop, La. 752.
- rotation studies, Fla. 609.
- yields and P in, effect of six P carriers and previous fertilizer treatments, Tenn. 471.
- bacterial inoculation, value, Utah, 192.
- boron in, Ky. 852.
- canning, method of measuring maturity, 343.
- cucumber mosaic virus pathogenic on, 360.
- damping-off, seed treatment for, Ariz. 628.
- disease resistance in, Md. 205.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases, seed-borne, 491.
- dry, production and marketing in Palouse area, Wash. 680.
- English, methods of planting, sticking, and fertilization, Miss. 51.
- fertilizer placement for, Md. 191.
- flat, seedings on burned-over land, West.Wash. 471.
- for canning and freezing, fertilizers and inoculation, West.Wash. 478.
- for canning and freezing, quality, relation to yield, West.Wash. 478.
- for seed production and for canning, Wyo. 48.
- freezing preservation, varietal suitability, U.S.D.A. 50.
- frozen, grades, tentative U. S. standards for, 155.

Pea(s)—Continued.

- frozen-pack, vitamin C in, factors affecting, Wash. 556.
- frozen, subjective scoring and sugar content, correlation, 847.
- garden, as cash crop, Wyo. 48.
- grading, Md. 191.
- maturity, determination, N.Y.State 153.
- moth, biological control, 785.
- poor germination, studies, Idaho 769.
- roots, excised, effects of root-growth hormone on meristem, 318.
- seedlings, stem and leaf growth, effects of light, 323.
- stand and yield, effect of seed treatment, 480.
- testing for near-wilt resistance, Idaho 769.
- variety tests, Md. 191.
- weevil, control, Idaho 786, Utah 642.
- winter, breeding, Tenn. 470.

Peach(es)—

- aphid, green, feeding habits and penetration rates, 370.
- ascorbic acid in, 424.
- bacterial leaf spot, control, Del. 65.
- bacterial spot, overwintering, U.S.D.A. 357.
- better stocks for, 352.
- borer, control, 86, U.S.D.A. 505.
- borer, ethylene dichloride for, Ky. 756.
- boron in, Ky. 852.
- breeding, Calif. 52, Iowa 190, N.Dak. 52.
- breeding, foliar characters for, 175.
- buds, effects of Zn deficiency, 367.
- buds, rest period, and glutathione, 350.
- canker, new, control, Mich. 65.
- cold injury at blossom time, varietal resistance, 56.
- consumer's preferences for, Del. 117.
- crosses of early ripening varieties, 55.
- culture, Mich. 621.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases, virus, 635.
- Elberta, prestorage treatment, 478.
- food storage, relation to nitrogen fertilization, N.C. 194.
- freestone, soft-ripe, canning, 300.
- freezing, varieties for, N.Y.State 847.
- fruit size and color, factors affecting, Mo. 764.
- Fusicoccum* canker in Massachusetts, U.S.D.A. 357.
- gas storage of, 353.
- genetic composition, Mass. 762.
- growth in sand culture, effect of N and P, Ky. 53.
- growth, relation to magnesium deficiency, Del. 47.
- injury from *Lygus* spp., prevention, 221.
- insects and diseases, Mich. 621.
- insects in eastern States, U.S.D.A. 505.
- leaf curl—
 - control, Del. 65.
 - studies, U.S.D.A. 768.
- little-leaf, zinc as corrective, 367.

Peach(es)—Continued.

- maturity and cold storage, studies, 761.
 - mosaic and disorders of canning varieties, Calif. 65.
 - mosaic virus, host range in western Colorado, 76.
 - orchards, replanted, causes of poor growth, Calif. 52.
 - orchards, soil moisture relations, S.C. 48.
 - Phillips Cling, size of aborted embryos in, 56.
 - phony disease, absence of in State, Ky. 769.
 - physiological changes during handling and railroad shipment, 352.
 - planting distances, economics of, Md. 190.
 - production, trends in, 352.
 - ripe Elberta and Peregrine, effect on respiration of unripe ones, 478.
 - rosette mosaic, new case of, 70.
 - Sclerotinia* spp. affecting, 779.
 - seedling stocks, wet feet tolerance of varieties, 55.
 - time of applying cyanamide to trees, Del. 47.
 - training, Miss. 345.
 - trees, delayed foliation and spray injury, 496.
 - trees dying in Virginia, 76.
 - twig borer on almonds, control, Calif. 83.
 - varietal resistance to arsenical injury, 482.
 - varieties, Fla. 619.
 - varieties, self-fruitfulness of, Del. 47.
 - variety tests, Ariz. 619, La. 762, N.Mex. 191, Tenn. 477.
 - virus diseases, 497.
 - viruses, Del. 65.
 - X-disease, 367.
 - yellow, carotenoids of, 440.
 - yellow-red virosis in, rapid transmission, 635.
- Peanut(s)—
- and peanut byproducts, vitamins in, Ga. 855.
 - and products, thiamin chloride and nicotinic acid in, Ga. 728.
 - breeding, Fla. 608.
 - breeding and new strains, Ga. 757.
 - culture experiments, Fla. 609.
 - deficiencies as swine feed, Fla. 651.
 - development, effect of photoperiod on, 173.
 - fertilizer tests, Fla. 609.
 - hay and nuts, yields, effect of inoculation, Ala. 470.
 - leaf spot diseases, control with copper, 768.
 - meal, value for livestock, Ga. 802.
 - oil press cake, protein extraction, Miss. 292.
 - plant, soluble minerals in, extraction and distribution, 740.
 - proteins, peptization of, Ga. 725.

Peanut(s)—Continued.

research, Ga. 186.
seed-coat color, inheritance, 175.
variety tests, Fla. 608, La. 752, S.C. 42
vitamins in, 740.

Pear(s)—

Anjou, response to irrigation in clay
adobe soil, Oreg. 194.
Bartlett, standards for measuring ma-
turity, Calif. 52.
Bon Chretien, ripening at 45° F., 478.
breeding, Iowa 190, Tenn. 477.
buds, rest period, and glutathione, 350.
Chinese sand, overwintering of *Bn*
tomosporium maculatum in dead leaves
of, La. 769.
clusters, blossom position and set of
fruit, Vt. 764.
crown and root rot, La. 769.
cultivated, origin and evolution, 621.
decay, fungi causing, 75.
diseases, estimated reduction in yield
from, U.S.D.A. 769.
diseases, notes, 365.
fire blight infection of blossoms, rela-
tion to nectar concentration, 779.
fire blight resistant, tests, Tenn. 477.
fire blight transmission by bees and re-
lation to nectar concentration, 779.
immunity to fungus diseases, relation to
origin, 75.
in Pacific Northwest, physiological
studies, U.S.D.A. 366.
production in California, 482.
rot, etiology and control, Wash. 487.
spot diseases, Wash. 487.
thrips, control, Calif. 83, West.Wash.
503.
trees, mature Kieffer, pruning, Mich. 194.
Winter Nellis, vitamin A and C in, Wash.
556.

Peat—

deposits of Puget lowland of Washing-
ton, 24.
materials, specifications for, N.J. 168.
resources in Alaska, U.S.D.A. 314.
structural characteristics, 446.

Pecan(s)—

analyses of oils, N.Mex. 268.
blossoming and nut setting, relation to
warm winter temperatures, 59.
breaking winter rest period, Ariz. 619.
cover crops for, Fla. 619.
fertilizer, culture, and varieties, Fla.
619.
growth and reproduction, relation to
nitrogen absorption and storage, Fla.
619.
leaves, photosynthetic activity, effect of
folar conditions, 59.
meats, fecal pollution on, media for de-
termining, 156.
nut case-bearer, studies, Fla. 641.
nut filling and maturity, factors affect-
ing, Ariz. 619.
oil content and filling, factors affecting,
59.

Pecan(s)—Continued.

orchards, *Phymatotrichum* root rot in,
Ariz. 628.
pistillate blossom'ng and pollen distri-
bution in, Ariz. 619.
seedling nursery blight, control, 768.
soils, phosphorus in, effect on pecan
foliage, 313.
storage, U.S.D.A. 411.
trees, rosetting, effect of nitrogen fer-
tilizers and zinc amendments, Ariz.
619.
varietal tolerance to warm winter tem-
peratures, Ariz. 619.
varieties, dichogamy of, blossoming rela-
tions, 198.
varieties, La. 761.
variety tests, La. 762, N.Mex. 191.

Pectin(s)—

fate in animal body, 561.
in plant material, criticism of paper on,
437.
research, Del. 5.

Pectinophora gossypiella, see Bollworm, pink.
Pediculus humanus corporis, see Body louse.

Pellagra—

in average population of Northern States,
860.
preventive factor in peanuts, Ga. 855.

Pemphres affinis—

parasite of, Biology, 515.
productivity and longevity, role of food
and its constituents, 645.

Penicillium digitatum, effect of emanations of
on lemons, 744.

Pennsylvania College, notes, 283, 576.

Pennsylvania Station, notes, 288.

Peperomia ring spot caused by virus, 371.

Pepper(s)—

Cercospora capsici leaf spot, La. 769.
chili and paprika, tests, N.Mex. 191.
cultural requirements, Mass. 762.
effect of mulching, Mass. 762.
Perfection pimienta, uptake of nutrients
by, 480, Ga. 51.
red, brooming disease, 361.
ring strain of tobacco mosaic on, 213.
seedbed troubles, control, Fla. 629.
varieties and fertilizers, La. 761.
varieties, characters for classification
and identification, 848.
weevil, studies, Fla. 641.

Peppermint—

oil, economic analysis of production, Ind.
834.
wilt in Indiana, U.S.D.A. 357.

p-Peptides, enzymatic hydrolysis, 853.

Peridermium strobil, see White pine blister
rust.

Periplaneta americana, see Cockroach, Ameri-
can.

Peronospora—

nicotianae in Argentina, 74.
trifoliorum, resistance of alfalfa to, 771.

Perosis—

due to vitamin deficiency, 674.
in chicks, bone phosphatase in, 673.

- Peroxis**—Continued.
 in chicks, effects of choline, gelatin, and creatine on, 97.
 in chicks, type of floor in battery brooders v. lack of sunlight as cause, Wis. 516.
 in turkeys, experiments related to choline, 673.
 preventive properties of orchard grass, Idaho 815.
- Persimmon**
 Oriental, floral situation, sex condition, and parthenocarp in, 58.
 rootstocks for, Calif. 52.
- Pest(s)**—
 control, patents relating to, U.S.D.A. 219.
 control, progress in, 375.
 of stored corn, Iowa 213.
- Petri dish**, maintenance of aerobic, micro-aerophilic, and anaerobic conditions in, 460.
- Petroleum oils** as insecticides, 503.
- Petunia**, change from diploidy to tetraploidy, effect on fertility, 602.
- Petunias**, growth, effects of organic materials, 60.
- Pfeifferella mallei**, antigen of, 528.
- Phagicola lageniformis**, new trematode in muskrat, 374.
- Phanomeris phyllotomae** parasite of birch leaf-mining sawfly, U.S.D.A. 229.
- Phasianus colchicus**—
 in partridge and pheasant, 82.
 plumage color in, inheritance, 746.
- Phatoma**—
barberi, notes, 645.
ecuadoris, notes, 645.
- Pheasant(s)**—
 distribution, north central, temperature factors in, 500.
 eggs, hatchability, relation to known temperatures, 374.
 helminths and coccidia in, 82.
 infected with equine encephalomyelitis virus, 402.
 management, Iowa 217.
 production in Iowa, 374.
 production, natural, relation to agricultural land use, 82.
 ring-necked, fall food supply in Rhode Island, 784.
 ring-necked, supernumerary wings on 467.
- Phenothiazine**—
 anthelmintic efficiency against stomach worms, 106, 109, 401.
 as anthelmintic for cattle under field conditions, 667.
 as anthelmintic for equines, 112, 403, Ky. 815.
 as anthelmintic for sheep, 669.
 colorimetric method for estimation, 585.
 continued feeding of, 667.
 conversion to thionol and its potentiometric characterization, 667.
 for emaciated horses, 671.
- Phenothiazine**—Continued.
 passage through sheep alimentary canal, 110.
 poisoning, 820.
 studies, 820.
 toxicity to bees, 228.
- o-Phenyl-phenol**—
 as disinfectant for oranges, 478.
 impregnated wraps, effect on mold in citrus fruits, 478.
- Phenylacetic acid**, failure to suppress lateral bud growth, 740.
- Philocterus corvi** in crows, 82.
- Phloem transport**, mechanism of, 454.
- Phlox**—
 embryos and seedlings, vascular system, development, 169.
 powdery mildew, Mass. 770.
- Phlyctaenia rubigalis**, see Celery leaf tier.
- Phoma**—
citricarpa, cause of orange black spot, 369.
 dieback of *Daphne genkwa*, R.I. 770.
- Phomopsis**—
 blight and fruit rot of eggplant, Fla. 629.
gardeniae, injury to gardenia from, Mass. 770.
vesana, varietal reaction of eggplant to, R.I. 770.
- Phormia regina**, toxicity of chemicals to, 510.
- Phosphatase(s)**—
 alkaline, effect of zinc on, 582.
 production by various micro-organisms, Iowa 238.
 serum, of guinea pigs with scurvy, 278.
 serum, values in infancy, 696.
 test and application to processed and treated milks, 660.
 test, critical review, 524.
 tests, comparison, Idaho 809.
- Phosphate(s)**—
 absorption in soil and related manuring and liming problems, 738.
 determination, Egner lactate method, 21.
 fertilizers, value, Iowa 160.
 for western Washington soils, comparison, West Wash. 446.
 ions, adsorption by clay minerals, 21.
 penetration in soils and availability to plants, Nev. 445.
 rock, rate of liming in conjunction with, Ky. 761.
 value for crops in Door County, Wis. 446.
 variety tests related to cotton wilt, 768.
- Phosphate-lime studies**, Tenn. 445.
- Phosphatic materials**, cooperative fertilizer studies with, Tenn. 445.
- Phosphoric acid** of Puerto Rico soils, P.R. 730.
- Phosphorus**—
 adsorption by Alabama soils, 166.
 application to soil and that removed by crops, relation, 166.
 availability, effect of calcium and vitamin D, 280.
 deficiency, effect on ovulation, oestrus, and reproduction in heifers, 391.

Phosphorus—Continued.

- deficient diet in rat, effect on tissues, 561.
- fixation and assimilation of fixed phosphates, 313.
- fixation by soil separates and fractions, 738.
- fixation in soils, Kans. 13.
- fixed, liberation in soil, effect of arsenic compounds, Mass. 729.
- forms in soils, and availability to plants, Iowa 160.
- in soils, availability, comparison of extracting solutions for measuring, 21.
- in soils, field-crop response and amount, Ala. 445.
- nutrient value in phosphatic materials, 21.
- of taro, utilization in diet, 123.
- of vegetables grown under known conditions of fertilization, 556.
- organic, in soils, nature of, Hawaii 160.
- radioactive, indicator of phosphorus absorption by tomatoes, 321.
- radioactive, soil studies with, Hawaii 160.
- requirements for fattening steers, Idaho 802.
- serum, values in infancy, 696.
- superphosphate and basic slag as profitable sources, Miss. 41.
- turnover of blood, relation to mineral metabolism of calcified tissues, 697.
- utilization in animal body, effect of ferric chloride, 417.
- Photoperiodic response of plants, effect of various wavebands of supplementary radiation, 29.
- Photosynthesis—
- bacterial, and importance, 173.
- by inorganic compounds, differential inhibition of photochemical and dark reactions in, 745.
- facts, and interpretations, 173.
- fundamental aspects, 600.
- in *Chlorella*, inhibition by minor elements, 169.
- in plants, relation to fluorescence of chlorophyll, 169.
- of apple leaves, effect of leafhopper injury, 778.
- of *Blodca canadensis*, oxygen evolution in, apparatus for determining, 456.
- of greenhouse rose, effect of sprays, Ohio 781.
- quantum efficiency, 173.
- use of radioactive CO₂ in, 171.
- Photosynthetic—
- activity and mass law of growth, relation to effects of growth substances, 453.
- mechanism, configuration of, effect of light intensity, 457.
- stimulation by a proprietary eosinlike material, negative results in, Mass. 739.
- Phycomyces* assays for thiamin activity, 172.

Phylloctes fockeui, studies, 785.*Phyllophaga*—

- ansia*, third year grubs, feeding habits and vertical movements, 785.
- lancoolata* on wheat, Kans. 84.
- sp. notes, 643.
- spp., control, sand-arsenical mixtures for, 791.
- spp., susceptibility to infection by type A milky disease, 512.
- submucida*, notes, Kans. 84.
- Phyllosticta derridis*, notes, 370.
- Phyllostoma nemorata*, parasites of, U.S.D.A. 229.
- Phymata pennsylvanica*, summary, 790.
- Phymatotrichum*—
- omnivorum*—
- control, progress in, 206.
- in cotton soil, effect of organic matter additions, 208.
- nutritional requirements, 492.
- response to trace elements, 454.
- root rot in pecan orchards, Ariz. 628.
- Physcomitrium turbinatum*, spore longevity in, 169.
- Physoderma on corn, La. 46.
- Phytic acid phosphorus, availability, 279.
- Phytomonas—
- barbariae* n.sp., notes, 78.
- cannae*, notes, Ariz. 628.
- lapse*, persistence on corn seed, U.S.D.A. 204.
- pruni*, overwintering, U.S.D.A. 357.
- rubi* n.sp. causing cane gall of bramble, 215.
- savastanoi*, inoculations of species of Oleaceae with, 77.
- sepedonica*, notes, 494.
- sepedonica* on potatoes, Wyo. 362.
- stewartii*, notes, U.S.D.A. 774.
- syringae* type disease, background and history, 628.
- tumefaciens* causing pathological growth, pathogenicity destroyed by specific amino acids, 64.
- tumefaciens*, effect on composition of beets, 361.
- vascularum*, hosts of, 776.
- vesicatoria*, variations in, 771.
- Phytopathogens, soil bacteria antagonistic to, 489.
- Phytopathology—
- in Brazil, history, 488.
- 30-year index, 577, 623.
- Phytophaga destructor*, see Hessian fly.
- Phytophthora*—
- cactorum* bleeding canker of maples, Mass. 769.
- cactorum* on hardwoods, 638.
- capsici* and *P. drechsleri*, tomato disease due to, 777.
- cinnamomi*, notes, 363.
- citrophthora*, cause of orange root rot and lemon gummosis, 77.
- citrophthora* type disease, background and history, 628.
- fragariae*, life history, 636.

Phytophthora—Continued.

infestans, see Potato blight, late.

nicotianae, notes, 635.

sp., new or little-known disease due to, Fla. 629.

Pickles, classification, 209.

Pickleworm, control, Ala. 409.

Picramic acid derivatives, toxicity and repellent action to greenhouse leaf tier, 507.

Pig(s)—see also Sows and Swine.

bacon, nutrition, 517.

Berkshire v. Duroc-Jersey × Berkshire, S.C. 92.

breeding stock, evaluation, Iowa 176.

breeds, crosses, Iowa 176.

brooder, electric, description, Wash. 116.

brooders, electric, Mazda lamps as source of heat in, Wash. 542.

calcium and phosphorus requirements, minimum, 382.

cane molasses yeast for protein replacement of soybean and tuna fish meals, Hawaii 231.

carcass quality characters, 387.

carotene supplements to barley ration, 382.

cash prices paid for, determining, Iowa 262.

composition, effect of submaintenance diet, 387.

convulsions in, relation to low blood calcium and phosphorus, 536.

Danish Landrace, value for improved strains, Iowa 176.

diseases and management, 254.

effect of high protein on, 382.

fattening, cooked taro and papaya for, Hawaii 231.

fattening hogs, supplements for, S.C. 92.

fattening, pineapple sirup v. cane molasses, Hawaii 231.

feeder, grazing crops for fattening, Fla. 651.

feeding wheat or malting barley to, 803.

fish refuse as food for, value, 517.

growing, calcium requirements, 803.

growth and fattening, optimum protein intake for, 386.

hereditary anomalies in, 177.

lameness in, manganese as factor, 95.

litter size, effect of type differences, 327.

mineral requirements, Wis. 516.

on pasture, levels of supplementary protein for, Pa. 803.

P requirements, relation to variations in P and vitamin D consumed, Kans. 92.

pastures for, Ky. 801.

pasturing alfalfa, sweetclover, and Sudan grass with, Wyo. 93.

Poland China, inbreeding, Iowa 176.

purebred and crossbred, comparison of ratios for, Nev. 516.

reproduction, relation to vitamin E, Iowa 231.

returns from \$100 spent for feed, Iowa 262.

Pig(s)—Continued.

role of vitamin E in growth and reproduction, 385.

shelled corn v. barley for, Tenn. 516.

skin temperature under winter conditions, 385.

soybean oil meal for, Mich. 234, Ohio 517.

Spotted Poland China compared with other breeds, 95.

spring- and fall-farrowed, relative growth, Fla. 651.

toxicity of lead arsenate and spray residues to, Wash. 527.

type, relation to carcass characteristics, 382.

weights and scores, litter and line differences in, 327.

Wessex saddleback breed, black color in, analysis, 747.

wheat feeding experiments, Oreg. 802.

Pigeon(s)—

breeding, progeny testing in, 466.

carrier, effect of castration on homing faculty, 179.

in Puerto Rico, parasite of, 82.

intestinal parasitism, 406.

Pigeonpeas, breeding, Fla. 608.

Pigeonpeas, strain tests, Fla. 609.

Pigments—

carotenoid, constitution and physiological significance, 7.

in leaves, state of, 171.

Pigweed seeds in crop seeds, germination, Iowa 182.

Pimientos, see Pepper(s).

Pinchot, G., biographical sketch, 121.

Pine(s)—see also White pine.

bark, fauna of, 789.

beetle, mountain—

effect on composition of mixed pole stands of conifers, 792.

new blue stain fungus associated with, 782.

blister rust, see White pine blister rust.

cones, extracting seed from, kiln design for, U.S.D.A. 625.

cones, ripeness tests, 355.

dieback under Canberra conditions, 373.

5-needled, relative susceptibility to *Cronartium ribicola*, 80.

fused needle disease, relation to nutrition, 80.

jack and Norway, competition effect on root systems, Vt. 766.

jack and red, on sandy soils, Wis. 485.

loblolly, establishment, factors affecting, 626.

loblolly, fire wounds on, relation to decay, 80.

loblolly, growth and mortality following partial cuttings, 356.

mineral deficiency in, symptoms, 64.

piñon, development of cones and seeds in, 355.

plantation, interception and stemflow in, 586.

Pine(s)—Continued.

- ponderosa, flower and cone production in, 767.
- ponderosa, long-lived, in Plumas County, Calif., 486.
- ponderosa, stands of north Idaho, relation of normal to average, 62.
- posts, nonpressure preservative treatment, S.C. 115.
- production, economics of, Calif. 62.
- red, saplings, root system, 626.
- sawyer beetle, possibilities in control, 785.
- Scotch, fasciation as a source of deformity in, 64.
- seed, red, longevity, 356.
- seedlings, hardening, effect of potash salts, 766.
- seedlings in water culture, boron deficiency symptoms, 373.
- seeds, multiple embryos in, and their germination, 355.
- shortleaf, seedlings, tolerance for variations in soluble Ca and pH, 626.
- slash and loblolly, yields, Ala. 485.
- southern, little-leaf disease of, U.S.D.A. 64.
- species, distribution of growth hormone in shoots, 598.
- species, period of seasonal growth, 626.
- species, pollen longevity, effect of storage conditions, 356.
- tip moth, life history and control, 794.
- twig blight favored by rainy weather, Wis. 488.
- western, dispersion of natural regeneration, 63.
- western yellow, ring growth, 588.

Pineapple—

- inducing flowering in, 198.
- yellow spot on tomato, Hawaii 204.

Pink eye of feeder cattle, Kans. 104.

Pifion nuts—

- analyses of oils, N.Mex. 268.
- managing woodlands for, 486.

Pifions or nut pines of Southwestern United States, 170.

Pinus ponderosa and *P. jeffreyi*, field characters distinguishing, 452.*Piricularia oryzae*, reaction of *Oryza* spp. to, 206.

Pistol casebearer—

- control, 86, Pa. 793.
- sprays for, Md. 219.

Pithecolobium lobatum, insect pests, 86.

Pitting machines, use, Wyo. 115.

Pituitary (ies)—

anterior—

- and vitamin B complex, interrelation, 855.
- extract, effect of injections on sexual phenomena in female opossum, 604.
- follicle-stimulating hormone purification, 179.
- growth hormone of, purification, 297.

Pituitary (ies)—Continued.

anterior—continued.

- of guinea pig strains, histologic studies, 177.
- structure, effect of gonadepinephrectomy, 469.
- bird, comparative histology, 603.
- bovine, morphological and functional relations, Minn. 232.
- chick, studies, 603.
- gland, androsterone effect on, 332.
- gonadotropic potency, effect of progesterone, 181.
- gonadotropins, synergism of oestrogens with, in hypophysectomized rats, 469.
- growth hormone, effect on thymectomized rat, 335.
- lactogenic hormone, electrophoretic behavior from cattle and sheep, 607.
- male rat, gonadotropic content, effect of protein ration, 519.
- mouse anterior, thyrotropic potency, 603.
- rat, effect of adrenalectomy on histology of anterior lobe, 603.

Planetary configurations, relation to world weather, 586.

Planter, London, rosy canker due to illuminating gas in soil, 81.

Planimeter, home-made, construction and use, 544.

Plant(s)—see also Flora(s) and Vegetation.

- absorption of fluorine by, Ariz. 694.
- and man, textbook, 814.
- and their environment, 315.
- ash constituents, micro determination, 444.
- availability of phosphates to, Nev. 445.
- biochemistry and physiology, 26.
- boron starvation of, control, 631.
- breeding for disease resistance, problems in, 359.
- breeding for insect resistance, 789.
- buds, lateral, lack of growth inhibition by phenylacetic acid, 740.
- bug, rapid, Kans. 84.
- bulbous ornamental, flower bud formation, Iowa 190.
- cell(s)—
 - cellulose crystallites in plastids of, 595.
 - differential sensitivity to X-rays, 324.
 - division, effect of hormones, auxins, etc., 169.
 - vacuolate, method of division in, 169.
 - wall structures, 325, 453.
 - walls, relative position in developing plant tissues, 740.
 - water relations, 27.
- chromosomes, see Chromosome(s).
- composition, effect of fertilizers and soil type, Wash. 445.
- composition, effect of soil conditions, Iowa 160.
- consumption of their rubber by, 456.
- culture equipment, 451.

Plant(s)—Continued.

- culture, soilless, possibilities and limitations, Utah 191.
- culture, soilless, simplified, 344.
- cuttings, new method of treating, 191.
- cuttings, rooting, effect of growth substances, 818, Iowa 190.
- cyanogenetic, mercuric chloride as preservative, 725.
- cytology, section-smear method for, 325
- deficiencies, relation to soil, 663.
- development, effect of leaf extracts and other organic substances, 595.
- development, hormone control, 326.
- diploidization process in, 746.
- disease(s)—*see also* Fungi and different host plants.
 - and pests, economy in control, 205.
 - and weather in Oklahoma, U.S.D.A. 357.
 - check-list revision, U.S.D.A. 64, 204, 357, 628, 768.
 - control problems, N.Y.State 770.
 - control, recent trends in, 487.
 - in California, control, 487.
 - in Hawaii, Hawaii 205.
 - in Jamaica, 66.
 - in New Jersey, U.S.D.A. 628.
 - in nurseries, biology and control, Iowa 205.
 - in Oklahoma, distribution and importance, Okla. 205.
 - in Texas, control, Tex. 357.
 - in Washington, seasonal report, Wash. 488.
 - new and interesting, 66.
 - newly recorded, U.S.D.A. 357.
 - of small ornamentals, identification and control, Iowa 205.
 - parasitic, main types of, 628.
 - resistance, measuring, nature and methods, Iowa 205.
 - resistance, nature of, 69.
 - seed-borne fungus lists, 206.
 - seed-borne, problems, 491.
 - seed treatments for control, Wyo. 69.
 - soil-borne, resistance of, relation to microbial population of rhizosphere, 69.
 - studies, exhibit for station visitors, N.Y.State 770.
 - survey of Iowa, Iowa 205.
 - susceptibility, relation to nutrition, 489.
 - unusually prevalent or new to Arizona, Ariz. 629.
- economic annuals and human cultures, 451.
- economic, efficient study, world wide collections of herbarium material necessary, 170.
- enzymic processes in, 173.
- evolution, basic principles of, 461.
- extracts for chlorophylls *a* and *b*, analysis, 594.
- flowering, soilless culture, Mass. 762.

Plant(s)—Continued.

- food, loss of, effect of green manure and cover crops, S.C. 14.
- geography, theory of, 170
- grasslike, occurrence and economic importance, N.Dak. 754.
- green, thiamin in, 169.
- green, toxicity of industrial gases to, 456.
- greenhouse—
 - diseases, Wash. 488.
 - methyl bromide fumigation, U.S.D.A. 501.
 - ornamental, effect of vitamin B₁, Ohio 464.
 - response to principal soil types, Iowa 190.
 - watering methods and distribution of water through soil, 60.
- ground-cover, for conservation and erosion, hillculture studies, Iowa 257.
- growing-point, composition, relation to daily light exposure, 323.
- growing under different conditions, detection, distribution, and mobility of elements in, Mich. 24.
- growth—
 - availability of nutrients, physiological aspects, 737.
 - effect of manure, 48.
 - essential nature of molybdenum for, 454.
 - habit, effect of light, 745.
 - inhibition by light, 745.
 - regulation, 740.
 - relation to zinc and auxin in, 172.
- growth substances—
 - as aids to root production in cuttings, 201.
 - distribution in pine shoots, 598.
 - effect on absciss layer of coleus leaves, 27.
 - effect on number and length of onion roots, 480.
 - effect on rooting of cuttings, Iowa 190.
 - effect on starch hydrolysis of bean leaves, 26.
 - effect, relation to photosynthetic activity, 453.
 - studies, 453.
- hormones, *see* Plant growth substances.
- horticultural, crow-bar method of applying nutrients or chemicals to, 191.
- house, culture, propagation, and handling, U.S.D.A. 624.
- house, insect enemies, control, U.S.D.A. 501.
- immigrants in Florida, 171.
- in waterfowl breeding areas, distribution and ecology, Iowa 171.
- insecticidal, of China, introduced into U.S., 87.
- intake of elements applied to soil in pairs *v.* applied singly, Mass. 729.
- introduction activities, Hawaii 190.

Plant(s)—Continued.

invading overgrowths in, experimental production, 64.

lice on cotton, S.C. 84.

magnesium requirements, Mass. 729.

malnutrition in, 356.

material(s)—

auxins in, estimation and identification, 741.

carotene in, determination, 583.

decomposing, microbial thermogenesis in, 38.

decomposition, effect on changes in lignin, 309.

decomposition, microbial thermogenesis in, 600.

decomposition, microbiological aspects, Iowa 160.

dehydration injury and resistance, 743.

imported for testing, U.S.D.A. 168.

introduced for testing, U.S.D.A. 595.

pectic content, criticism of paper on, 437.

medicinal, wild, of United States, distribution and abundance, 170.

metabolism and flowering, 322.

mineral absorption, relation to lignin, Mass. 724.

mineral status determined by analysis and injection, 357.

names, specific, decapitalization, 170.

names, Swahili-botanical-English dictionary of, 28.

nitrogen metabolism of, role of vitamin C in, 169.

nutrient(s)—

and soil correctives, crow-bar method of applying, 191.

in soil, meanings attached to, 735.

leaching through soil, effect of various cropping systems, Wash. 445.

substrates for, balance of ions and oxygen tension in, 737.

nutrition—

and foliar diagnosis, 740.

aspects of progress in, 453.

function of soil organic matter, 736.

Liebig's concept, 739.

organic, 171.

physiological phases, Fla. 596.

relation to disease susceptibility, 489.

studies, use of *Lemna* for, 596.

of Venezuela, analytical key to genera, 452.

ornamental—

causes of failure of seed and seedlings, Fla. 629.

diseases of, 78.

diseases due to soil-infesting organisms, control, Mass. 769.

fumigant for pests of, 220.

testing for heat resistance and for cut flower production, Iowa 190.

tests, Fla. 619, N.Mex. 191.

pathogens, bacterial, transmutation, 206.

Plant(s)—Continued.

pathogens, seed-borne, detecting, Iowa 205.

pathology, background and history, 628.

pathology, fundamental aspects of, 488.

pathology, history, 64.

phenology, 315.

photoperiodic response, effect of various wavebands of supplementary radiation, 29.

photosynthesis, *see* Photosynthesis.

physiology and biochemistry, 26.

poisonous, of Brazil, 665.

poisonous to livestock, Fla. 665, Md. 248.

polyploid forms, production by use of colchicine, Hawaii 190.

preferences for soil reaction, Mich. 311.

propagation, new method, 624.

proteins, amino acid deficiencies, 232.

quarantine law of Wisconsin, U.S.D.A. 628.

residues, decomposed, hypochlorite oxidation, 438.

resistant or tolerant to root knot nematodes, U.S.D.A. 631.

respiration, *see* Respiration.

response to intermittent supplementary light, 199.

response to magnesium and minor elements, Ala. 445.

rest period in, relation to changes in water regime, 342.

roots, behavior of viruses in, 630.

roots, rate of decomposition, 591.

rotenone-containing, evaluation, 641.

science, trends in, 314.

selection, modern experimental design and function in, 171.

taxonomy, ecology, and geography, research in, 451.

taxonomy, trends in, 170.

tissue(s)—

effect of calcium on, 155.

extraction of auxin from, 26.

green, isolation of carotene from, 152.

hormone extractions, expression of yields, 169.

improved paraffin schedules for, 325.

liberation of auxin from, 170.

nitrogen in, chlorate method, determination of ammonia and amide nitrogen in, 5.

press for recovery of fluids from, 451.

salt relations, 455.

substance in protecting vitamin C from oxidation, 705.

transpiration, *see* Transpiration.

use of adsorbed phosphate by, 21.

variability within a population, effect of environment, 49.

vascular, initiation of vascular tissues in, 169.

vegetative and reproductive development, relation to temperature, 191.

Plant(s)—Continued.

- viruses—
 binomial system of nomenclature for, 359.
 chemical inactivation and reactivation, 770.
 chemical, medical, and philosophical aspects, 490.
 effect of alkali and simple organic substances, 68.
 evidence against mechanical transmission by aphids, 490.
 experimental investigation, 68.
 inactivation, 358, Wis. 488.
 inactivation by urea, 68.
 interaction of, 207.
 relations with vector and nonvector insects, 789.
 transmission by dodder, 630.
 white tip, relation to copper in soil, 208.
 wilting due to changes in root temperature, Mass. 739.
 winter hardened condition, effects of periods of warm weather, 458.
 woody, see Woody.
 wound healing in, 172.
- Plasma proteins, source, production, and utilization, 439.
- Plasmodesmata, review, 460.
- Plasmodium—
catheherium modifications when transferred from birds to fowl, 828.
durac n.sp. in turkey, 827.
lophurae, pathology and effects of experimental conditions, 404.
relictum, exoerythrocytic schizogony associated with maternal strain after passage through ducks, 827.
relictum in crows, 82.
relictum, oral transmission in pigeon, 828.
 spp., distribution in visceral organs compared with peripheral blood, 404.
- Playa lakes in southern Great Plains, ecological relations, 337.
- Plecoptera of world, catalog, [N.Y.] Cornell 220.
- Plow—
 bottoms, moldboard, effect of shape on draft, 544.
 eccentric one-way, use, Wyo. 115.
 moldboard, manufacture of disks for, Wyo. 115.
 shapes and materials, comparative tests, Ala. 542.
- Plum(s)—
 and apricot hybrids, cytological studies, 34.
 aphid, mealy, control, Calif. 83.
 ascorbic acid in, 424.
 breeding, Iowa 190.
 curculio in apples, control, Mass. 787.
 curculio on peach, control, 513, U.S.D.A. 505.
 curculio on peach, petal-fall application of lead arsenate in control, 793.
 curculio, studies, 86, Del. 84, Tenn. 502.
 fruit-leaf ratios in, Wash. 477.

Plum(s)—Continued.

- Kelsey, prestorage treatment, 478.
 leafhopper, feeding habits, 377.
 leafhopper, in Ontario, 785.
 Malabar, rust, in Brazil, 497.
 nursery mite, studies, 785.
 ripe Gaviota, effect on unripe fruit, 478.
 Santa Rosa, prestorage treatment and respiration, 478.
 variety tests, 482, Ind. 764, N.Mex. 191.
- Plywood, use in farm-building construction, Iowa 257.
- Pneumococcic infections, effect of sulfonamide drugs in, 106.
- Pneumonia—
 in calves, outbreak, cause, 401.
 pneumococcal, role of coenzymes I and II in blood, 414.
- Psigalis cruciatus*, biology and immature stages, U.S.D.A. 280.
- Poa sandbergii*, status in North America, 315.
- Poa secunda*, status and description, 315.
- Poisonous plants, see Plants, poisonous, and specific plants.
- Poisons, contact, testing toxicity to American cockroaches, 87.
- Polarographic analysis, Hawaii 160.
- Pollen, insects, and micro-organisms, airborne populations of, technics for appraising, 66.
- Pollen, role in economy of beehive, U.S.D.A. 502.
- Polychorosis viteana*, see Grape berry moth.
- Polydactyly in fowl, new type, 36.
- Polyembryony in pine, 355.
- Polygonum* seeds, dormancy in, [N.Y.] Cornell 744.
- Polyploidy—
 hormonal, in plants, 169.
 induced, effect in plants, 326.
 types of, 462.
- Polyporaceae, new species, 171.
- Polypores, resupinate, from Great Lakes region, 358.
- Polyporus*—
basilaris, biology, 79.
schweinitzii, effect on specific gravity and strength of conifers, U.S.D.A. 639.
schweinitzii injury to white pine, Mich. 216.
- Polystictus*—
 polypores, taxonomic study, 358.
versicolor, notes, 498.
- Pomace fly, new technic for using in tests with contact insecticides, 785.
- Popcorn, variety tests, Kana. 40, West. Wash. 471.
- Popillia japonica*, see Japanese beetle.
- Poplar—
 leaf-spot diseases caused by *Septoria* spp., 81.
 yellow, snow-damaged, top rot in, 79.
 yellow, twig and bud composition, changes in during dormancy, 627.
- Population—
 agricultural, decrease in, causes and effects, 341.

Population—Continued.

- and land relations, R.I. 842.
- distribution in California, recent trends in, 688.
- farm, sources and distribution, relation to farm benefit payments, 842.
- German pioneer, distribution in Mianca sota, 843.
- migration and natural increase, 120.
- movement to and from farms, Ky. 840.
- rural, in petroleum-producing area, sickness and medical care, Ark. 843.

Poria polypores, taxonomic study, 353.

Pork—

- color of lean and rancidity of fat, effect of temperature during frozen storage, 385.
- cured, storage, Miss. 383, 845.
- diets, effect on pregnancy disorder, Iowa 268.
- flavor, effect of paradichlorobenzene, 382.
- held in low-temperature storage for different intervals, keeping qualities, effect of soybeans, Iowa 231.
- lard and fat cuts, declining importance, Iowa 262.
- muscle, autoclaved, biological values, Iowa 268.
- muscle, dried, thiamin in, 860.
- processing for storage in freezer lockers, Kans. 92.
- production, Miss. 234, 383.
- production, skim milk as replacement for grain in, Wyo. 93.
- production, swine type as factor in, 382.
- quality, effect of soybeans, Iowa 231.

Porometer cup, simple, for class use, 23.

Porosagrotis orthogonia, see Cutworm, pale western.

Potash—

- deficiency in New England, 449.
- deficiency, relation to tobacco diseases, Ky. 769.
- effect of rates of application and forms on tobacco yield and quality, S.C. 42.

Potassium—

- acid phosphate in talc dust, effect on rooting of stem cuttings, 318.
- and calcium metaphosphates availability, Del. 13.
- availability—
 - effect of base-exchange capacity and of exchangeable ions in soils, Mass. 729.
 - on soil types and crop response to, Iowa 160.
 - use, and fixation, 594.
- available, in Alabama soils, 594.
- fixation, relation to exchange capacity in soil, 310.
- fixation studies, Tenn. 445.
- in cotton plant, 453.
- leaching, effect of winter legumes, Ala. 445.
- naphthylacetate, effect on germination and early growth of wheat, 593.

Potassium—Continued.

- nitrate, effect on germination and early growth of wheat, 598.
- requirement by chicks, 390.
- soap of wood rosin, tests, 504.
- soil, effects of freezing and thawing on, Wis. 446.
- sorption by Hawaiian clay soils, 739.
- value for crops in Door County, Wis. 446.

Potato(es)—

- aphid on tobacco, feeding habits and penetration rates, 376.
- aphid sprays, Me. 642.
- aphid survey in New Brunswick, 785.
- ascorbic acid in, effect of cooking, Wyo. 122.

bacterial ring rot—

- control, Calif. 65, Mont. 73.
- first confirmed case in State, R.I. 770.
- notes, 776, Colo. 362, Wyo. 362.
- possible dissemination by grasshoppers, N.Dak. 72.
- results of attempted eradication, 776.

bacterial wilt and soft rot, 362.

beetle, Colorado, control, Ala. 499, Colo. 219, Iowa 218.

blight, early—

- spray tests, Me. 629.
- spraying and fertilization for, Hawaii 205.

blight, late—

- reduced toxicity of cuprous oxide to by addition of other material, 776.
- seed-source control for, U.S.D.A. 357.
- studies, 776, U.S.D.A. 768.

blights, studies, N.J. 362.

boron in, Ky. 852.

breeding, Iowa 182, Wash. 471.

breeding for virus disease resistance, Idaho 769.

cash profits on, relation to acreage, Tenn. 575.

certification, Wyo. 43.

chips, production, factors for color in, 557.

consumption and dietetic value, 122.

conveyor for handling, Mich. 261.

cooked, blackening, 122.

cooked, cause of blackening in, 692.

cooking quality, factors affecting, Colo. 556.

cooking quality preferences for, 269.

culture and storage, 476.

culture experiments, Hawaii 182, Kans. 40, Miss. 336, N.Mex. 183, Tenn. 470, Wyo. 43.

discs, metabolism, effect of salt concentration, 455.

disease(s)—

- and production of disease-free stocks, Me. 629.
- control, Fla. 629.
- estimated reduction in yield from, U.S.D.A. 769.

Potato(es)—Continued.

disease(s)—continued.

in Dade County, control, Fla. 620.

losses from in Florida, U.S.D.A. 768.

purple dwarf, in Alberta, 211.

seed treatments for control, Wyo. 69.

studies, Kans. 65.

virus, protective inoculation for control, 72.

diseased, fluorescence of, 493.

dusting materials, studies, 648.

effect of day length on growth, maturity, and tuber characters, 740.

effect of nematodes, Hawaii 205.

effect of type and treatment of soils, Fla. 589.

enterprise in Garrett County, Md. 263

fertilizer tests, Fla. 187, 609, Hawaii

182, Idaho 751, Kans. 40, La. 752.

Md. 182, Me. 609, Miss. 336, R.I. 753.

Tenn. 471, Wis. 472, Wyo. 43.

flea beetle—

and tobacco thrips, simultaneous control, Conn.[New Haven] 786.

biology and control, Wash. 503.

control, nine year study, 375.

on shade-grown tobacco, control, 512. studies, Colo. 219, Iowa 218.

foundation seed, roguing service for producers, Me. 46.

Fusarium wilt, varietal susceptibility, 775.

grades and reasons for failure to grade U. S. No. 1, Kans. 117.

green manure crops for, Fla. 609.

Hawaiian-grown new, analyses and vitamin assays, Hawaii 268.

hopperburn, comparative resistance of Houma and Katahdin varieties, Wis. 472.

hybrids, new, testing for resistance to tuber and soil-inhabiting parasites, Iowa 205.

insect survey, Idaho 786.

insects destructive to, Hawaii 218.

insects, review of entomological research, 505.

insects, studies, N.Mex. 219.

insoluble sprays for, tests, Mich. 65.

Kansas, marketing, Kans. 117.

leaf(ves)—

and tubers, comparative boron content, 595, 598.

roll and net necrosis, control, West. Wash. 488.

roll, losses in yield caused by, 774.

leafhopper, control, Colo. 219, Iowa 218.

leafhopper, feeding habits, 377.

losses due to diseased or missing plants, determination, 774.

manure and fertilizer tests, Wash. 503.

mealiness, effect of fertilizers, Me. 691.

mosaic, clover leafhopper as vector, Wis. 488.

nutrient deficiency symptoms in, 357.

Potato(es)—Continued.

planting, spraying, and pH range tests, R.I. 753.

powdery mildew, 72.

production and marketing, R.I. 830.

production, farm organization and costs and returns in, Me. 681.

psyllid(s)—

control, sulfur dusting v. spraying, Wyo. 43.

studies, Colo. 219, U.S.D.A. 502.

yellow, control, Wyo. 362.

pyramid style of loading cars, advantages of, Kans. 117.

reciprocal hybrids, cytological survey, 462.

Rhizoctonia diseases, control, Fla. 629.

ring rot—

bacteria infecting tomatoes, Wis. 488.

control, 494, Me. 629.

development, temperature effect, Wis. 488.

identification and disinfection of seed pieces, N.Dak. 494.

new, in Nebraska, 494.

studies, 211, Idaho 769, Mont. 211.

Russet Burbank, vitamin B complex factors in, Idaho 855.

scab control methods, N.J. 775.

scab, effect of agronomic practices, 493. scab notes, Tenn. 487.

scab, reappearance in infested and almost uninfested land, 362.

scab reduced by sulfur, Wis. 488.

scab, seed treatments for, Idaho 769.

seed improvement and disease resistance and control, Md. 205.

seed-piece decay in transit, and prevention, Fla. 629.

seed piece, experiments with, Kans. 40.

seed pieces, mites on, Fla. 642.

seed, roguing service for producers, Me. 312, 609.

seed stocks, diseases, causal agents, Iowa 205.

seed stocks, foundation, improvement, Wis. 471.

seed storage and treatment tests, Hawaii 182.

seed treatment and irrigation tests, N.Mex. 183.

seed, treatment for destruction of eelworm cysts, effect, 363.

seed, treatment, strength of mercuric chloride solutions for, Me. 629.

solanine, factors affecting synthesis and distribution, 170.

spacing and seeding rate, Fla. 609.

species, triploid, production of tetraploid plants in, 463.

spindling sprout, nature of, 72.

spray studies, 403.

spraying experiments, Mass. 787.

spraying with bordeaux, effect of varying copper lime ratios, 634.

Potato(es)—Continued.

- storage, losses from different handling methods, Mich. 115.
- strain tests, Fla. 609.
- studies, Miss. 336.
- time and amount of irrigation for, tests, Wash. 471.
- tobacco streak on, Ky. 769.
- Triumph, clonal strains, response to environment, 187.

tuber(s)—

- Actinomyces* in, 775.
- distribution of vitamin C in, 708.
- hastening maturity, Idaho 751.
- old, sprouting, relation to water in, 342.
- pathogenicity of *Alternaria solani* to, 210.
- pathogens, *Botrytis* and *Sclerotinia* as, 210.
- tissues, *Actinomyces* in, staining, 362.
- varieties, cooking tests, Wis. 472.
- variety tests, Fla. 608, Hawaii 182, Idaho 751, Iowa 182, La. 752, Mass. 752, Miss. 337, N.Mex. 183, R.I. 753, Tenn. 470, Wash. 471, Wis. 471, Wyo. 43.
- virus diseases, Wash. 488.
- virus diseases and aphid transmission, Me. 222.
- viruses, insect vectors, Me. 642.
- vitamin C in, 707.
- washed and unwashed, losses from desiccation, decay, and spoilage, Kans. 117.
- wireworm damage on irrigated land, U.S.D.A. 518.
- X virus, effect of alkali and simple organic substances, 68.
- X virus, inactivation by urea, 68.
- yellow dwarf and scab, varietal immunity, Wis. 488.

yield(s)—

- and quality, effect of fertilizers, Mont. 757.
- effect of latent virus X on, 493.
- effect of soil management and crop rotation, Idaho 751.
- effect of split applications of complete fertilizer, 476.
- relation to cultural practices and disease control, 774.

Poultry—see also Chick(s), Chicken(s), Cockerels, Duck(s), Fowl(s), Hen(s), etc.

- artificial insemination for developing a more critical progeny test for, Kans. 92.
- artificial insemination of, N.J. 467.
- autopsy examinations, R.I. 815.
- barring, role of melanophores in, 329.
- battery brooder designed for nutritional research, 809.
- breeding, Fla. 604.
- breeds, merits, N.J. 804.
- breeds, parallel variation in plumage colors, 605.

Poultry—Continued.

brooder(s)—

- electric, in colony houses, Mass. 826.
- home-made lamp, construction, Ala. 547.
- house, new portable, Ohio 547.
- carcass, post-mortem changes in, Iowa 231.
- carrots as green feed substitute, Mich. 235.
- clutch length in relation to period of illumination, 603.
- cooperative marketing, factors affecting future of, Iowa 262.
- diseases—
 - and parasites, Nebr. 539.
 - bibliography, 113.
 - etiology, diagnosis, and treatment, 539.
 - nutritional deficiency, 255.
 - studies, Kans. 104.
- effect of size of flocks and breeds on receipts per hen, Kans. 117.
- farm prices, index numbers, Fla. 677.
- farms, efficiency of natural agents of disinfection and of disinfectants used on, Wash. 528.
- fattening, methods and rations, 654.
- fattening tests, Fla. 651.
- feeding and breeding, Mass. 804.
- feeding, principles, 388.
- feeding value of industrial alcohol by-product, Md. 231.
- feeds, riboflavin in, 235.
- feeds, vitamin E in, Iowa 231.
- flocks, commercial, vitamin A deficiency in, 113.
- green feeds for, Ala. 515.
- gross margins on, Kans. 117.
- growth rate, Mo. 388.
- hatchability, growth, and mortality, effect of ground grain and mill run, West.Wash. 518.
- heart rate, 388.
- housing, Wyo. 93.
- husbandry, principles, 388.
- Improvement Plan, National, regional conferences on, U.S.D.A. 95.
- in Malaya, seasonal loss of condition, 518.
- industry, need for growth, Miss. 551.
- inheritance in, West.Wash. 466.
- lice, studies, Ky. 786.
- manganese absorption in, 806.
- market, gains and quality, effect of rations, Iowa 231.
- marketing, economic problems affecting, Calif. 686.
- mares without milk, effect on hatchability, Wis. 516.
- need for carotenoid pigments in alfalfa, effect of vitamin A in ration, Idaho 801.
- nematode parasites, epidemiology, and inter-host relations, Ala. 539.
- nutrition, minerals in, 389.

Poultry—Continued.

- nutrition, protein in, 805.
- oystershells and clamshells as mineral supplements for, Fla. 651.
- parasites, biological control, Hawaii 247.
- parasites, efficiency of phenothiazine and related products in removing, Wash. 528.
- parasites, newer knowledge, 664.
- production experiments, Del. 93, West. Wash. 518.
- protein supplements for, gross value Wash. 516.
- purebred and crossbred, efficiency in fecund utilization, Md. 231.
- range shelter with galvanized iron roof Ohio 547.
- range shelters, construction, use of poles in, Miss. 547.
- rations, distillers' byproducts for, 235.
- rations, effect of changes in milling and manufacturing on nutritional value, 383.
- rations, home-mixed, La. 96.
- rations, sorghum grain for, Colo. 806.
- reproduction and fertility in, Md. 178.
- Research Laboratory, Regional, proposed breeding program, 466.
- respiratory diseases, differential diagnosis, 664.
- returns per \$100 worth of feed and pasture costs, Iowa 262.
- Rhode Island Red, inheritance of broodiness in, Mass. 35.
- role of vitamin E in growth and reproduction, 385.
- skeletal dimensions, relation to body weight and egg production, 35.
- vitamin A deficiency in, Md. 231.
- vitamin A for shark-liver oil as source, Fla. 651.
- vitamin K requirements, Wis. 516.
- White Leghorns, inheritance of slow feathering and eggshell quality, West. Wash. 406.
- Powdery mildew studies, Calif. 65.
- Power- and flood-warning, quantitative forecast system for, 159.
- Power, field, and machinery, Idaho 828.
- Power waste in operating cotton gins, reducing, U.S.D.A. 545.
- Pox in pigs, outbreak, 537.
- Prairie chickens endoparasites of Wisconsin, 406.
- Prairie soils, organic matter in, nature, effect of rainfall, 165.
- Precipitation—*see also* Rainfall, Snow, etc.
 - gages, shielded, on Blue Hill and Mount Washington, 302.
 - general, important cause, 12.
 - records in California tree rings, 302.
 - records taken by standard Canadian and United States gages, variation in, 586.
- Pregnancy—
 - disease, causes, Calif. 104.
 - in mares, diagnosis, Md. 178.

Pregnancy—Continued.

- of rat, changes in follicular apparatus during, 180.
- toxemic, production and cure, dietary factors in, Iowa 268.
- Pregnant mare serum preparations, crude and purified, production of antihormone to, 604.
- Pressure-cooker gages, reliability, Wyo. 122.
- Pressure variations, effects of tropospheric and stratospheric advection on, 12.
- Price indexes for farm products, Ky. 697, Mich. 687.
- Procladius* midges, chlorinated benzenes for control, 510.
- Prodena eridania*, *see* Armyworm, southern.
- Progesterone—
 - assay of pregnant cattle and extracis having mammary growth activity, 333.
 - effect on gonadotropic potency of rat pituitary, 181.
 - effect on mouse uterus, 38.
 - effect on reproductive tract of spayed ewes, 332.
 - overdosage, effect on female accessory sex organs of rats, 39.
- Propionic acid requirements of bacteria, Iowa 151.
- Prospermin, effect on immature and mature hypophysectomized and normal male rats, 37.
- Prosthogonimus macrorhisis* in ruffed grouse, 405.
- Protein(s)—
 - absorption by montmorillonitic clay and effect on base-exchange capacity, 730.
 - anticataractogenic quality, effect of dry heat, 273.
 - concentrates, animal, quality index and chemical analyses, 383.
 - concentrates, evaluation with hens, Wash. 516.
 - extraction, Miss. 292.
 - fibers, descriptions and photomicrographs, 141.
 - films and susceptibility of starch to diastatic attack, 581.
 - metabolism of plants, possible function of vitamin B₂ in, 170.
 - milk-producing qualities, 391.
 - of soybeans, effect of cystine and methionine, 93.
 - supplements for chicks, soybean meal and infertile eggs as, Wis. 516.
 - supplements for swine, comparison, Kans. 92.
 - use by sheep on natural grazing at different seasons, 233.
- Proteus* spp. in foxes, lactose-fermenting variants, 819.
- Prothrombin—
 - deficiency of newborn infant, 140.
 - determination, thromboplastin reagent for, 584.
 - estimation, 443.
 - level in newborn infants, effect of vitamin K analogues, 139.

Frothrombin—Continued.

- levels, normal and abnormal, 279.
- plasma, determination, 713.
- plasma, in newborn infant, 713.
- test, description, 428.
- test, Quick's, stable thromboplastin for, 10.

times in newborn, 139.

Protocylas new genus, erection, 227.*Protoparce quinquemaculata*, see Tobacco worm.

Protoplasm—

- and cell, symposium, 453, 461.
- molecular structure in, 453.
- physical state, relation to frost resistance, 27.
- structural viscosity, effect of bile salts and oleates, 27.

Protostrongylus infection of white-tailed deer, tissue changes in, 402.

Protozoa—

- effect on nitrogen fixation by *Azotobacter chroococcum*, 166.
- in biological research, 784.

Provitamin D of covering tissues of chicks, 236.

Prune(s)—

- boron in, Ky. 852.
- dried, marketing through cooperative packing associations, Oreg. 685.
- drying ratio and size, Calif. 52.
- effect of boron in irrigation water, U.S.D.A. 367.
- nectar, development, Idaho 761.
- products, canned, Calif. 5.
- Sclerotinia* spp. affecting, 780.
- thrips control, 86.
- trees, vein clearing, a transmissible disease, 214.

Prunus besseyi, new host for X-disease virus, U.S.D.A. 768.*Prunus* spp., rooting, response to growth substance, 195.*Psallus seriatus*, see Cotton flea hopper.*Pseudantonina arundinariae* n.sp., description, 506.

Pseudococcidae, new species, 506.

Pseudococcus—

- citri*, see Mealybug, citrus.
- comstocki*, see Mealybug, Comstock's
- diodium* n.sp., description, 506.
- juncus* n.sp., description, 506.

Pseudomonas—

- citri*, see Citrus canker.
- fragi*, distribution, 102, 394.
- putrefaciens*, distribution, 33.
- putrefaciens*, growth on aroma compounds in butter, effect, 520.
- putrefaciens* important in dairy products, Iowa 102.
- solanacearum*, notes, 635.

Pseudopeziza—

- medioginis*, resistance of alfalfa to, 771.
- meliloti*, resistance of sweetclover to, 771.

Pseudopregnancy reaction in rabbits, inhibition, 750.

Psittacosis, recognition, 817.

Psoriasis, control, Calif. 65.

Psychoda species in sewage bacteria beds, abundance and size, 377.

Ptinidae of economic importance, 380.

Puccinia—

glumarum, first record in United States east of 103d meridian, U.S.D.A. 768.

glumarum, physiological studies, 491.

graminis, physiological races in United States in 1939, U.S.D.A. 491.

graminis tritici, see Wheat stem rust.

minusensis, studies, 206.

n.sp., morphology, 315.

peridermitespora leaf rust of ash, epidemic of, R.I. 770.

psidii on Malabar plum in Brazil, 497.

tritici, physiologic races, reaction and distribution in Canada, 359.

Puerto Rico Federal Station, notes, 432, 719.

Puerto Rico Station, report, 286.

Pullets—

albumen index of eggs laid at different

seasons, effect of age, 805.

clover pasture for, big returns from, Ohio 518.

laying, effect of sulfur feeding, 236.

laying, fodder yeast for, 805.

Pullorum disease—see also *Salmonella pullorum*.

breeding for resistance to, Md. 178.

control and eradication, progress in, 664.

eradication, efficacy of rapid agglutination test, 405.

in turkey flocks, eradication, 664.

in turkey poults, carriers of and eradication program, Colo. 541.

resistance in chickens, 748, 827.

studies, Idaho 815, Mass. 815, Wyo. 105.

susceptibility of breeds, comparison, 540.

transmissibility to hens by males, West. Wash. 539.

vaccination with fowl typhoid vaccines, Kans. 104.

whole blood and tube agglutination tests, comparison, 404.

Pullorum-like disease, outbreaks in poultry, 827.

Pullularia disease, notes, 73.

Pumping equipment, forecasting, Ariz. 675.

Pumpkin(s)—

canning, improvement in type and quality, Iowa 190.

phloem exudate, significance, 454.

seed, globulin of, substitute for hempseed edestin, 270.

Purdue University, notes, 144.

Purple scale—

control, derris as toxic supplement to oil emulsion, Ala. 499.

development, effect of fertilizers, Fla. 641.

fumigation with hydrocyanic acid, 223.

Purpura, vascular, treatment with vitamin P, 574.

- Purshia tridentata*, phytochemical and histological study, 174.
- Pylonephritis, bovine, diagnosis and treatment, Md. 248.
- Pygmephorus crassipes* n.sp. notes, 85.
- Pyrausta nubilalis*, see Corn borer, European
- Pyrethrins—
colorless concentrates, extraction and preparation, 642.
determination, 585.
- Pyrethrum—
agents for increasing toxicity to mosquitoes, 509.
as crop in western Washington, West. Wash. 503.
flowers, chemical evaluation, 642.
harvesting, U.S.D.A. 59.
improvement, Tenn. 477.
sprays, rosin residue as spreader for, 504.
- Pyridine, failure to improve growth of excised tomato roots, 318.
- Pyridoxin, see Vitamin B₆.
- Pyroclide dust effective in preventing *Lygus* injury to peaches, 221.
- Pyruvic acid—
in blood, stabilization and determination, 852.
iodimetric determination, improved method, 439.
- Pythium*—
damping-off, Hawaii 205.
graminicola on barley, Iowa 772.
marisplum n.sp., description, 452.
spp. associated with rice root rot, La. 772.
spp. with proliferous sporangia, 452.
ultimum, notes, 66.
- Quackgrass—
control by cultivation, Wyo. 43.
vegetative growing points, studies, 43.
- Quail—
bobwhite—
age classes of winter cover used by, 82.
fall food supply in Rhode Island, 784.
foods, relation to farm problems, 500.
Tetrameres americana in, 640.
toxicity of *Oryzalaria spectabilis* seeds for, 784.
wintering, analysis of environmental carrying capacity, Iowa 217.
fed raw meat, nose-picking form of cannibalism in, control, 542.
female, seasonal hyperossification of skeletal system, 604.
in Texas, plants valuable to, 374.
management, Iowa 217.
ulcerative enteritis in, Mo. 256.
- Quercus—
chromosome numbers in, 464.
oglethorpensis n.sp., description, 170, 171.
taxonomy, relation to wood anatomy, 170.
- Quince—
diseases, notes, 365.
immunity to fungus diseases, relation to origin, 73.
- Quinones, vitamin K activity, 714.
- Rabbit(s)—
and rodents, identification by fecal pellets, 490.
body size relation to morphological variations, 747.
cottontail—
food habits, 374.
infection of lymph system, 783.
nesting study in Pennsylvania, 500.
studies, Iowa 217.
digestible nutrients of feeding stuffs for, 234.
domestic, pseudopregnancy in, 639.
Flemish and smaller types, fertility in, 604.
gestation period, experimental lengthening, 603.
Mearns cottontail, nesting cover used by, 499.
minimum requirement for α -tocopherol, 278.
of California, classification and biology, 374.
ovum growth in vitro, 334.
reactions of intraocular ovarian transplants to gonadotropic stimulation, 603.
reproductive and endocrine organs, growth, 181.
waved, new coat type in, 604.
wild, ecology and population dynamics, 639.
- Rabies—
strains of equine encephalomyelitis, virus, 254.
vaccines, laboratory tests of potency, 105.
- Raccoon, ecology and management, Iowa 217.
- Radium and X-ray burns, curative properties of aloes, 595.
- Rattus*—
cestioides—
evagination of larvae, use of bile salts for, 500.
in poultry, treatment, 114.
removal from chickens, tests with tetra-alkyl tin compounds, 674.
tetragona in ruffed grouse, 405.
variabilis from prairie chicken, variation in new species, 406.
- Railroad box cars in which wheat has been shipped, insect infestation, 376.
- Rain gage(s)—
shields and enclosures, exploratory study, 302.
standard Canadian and United States, precipitation records, variation in, 586.
- Rainfall—see also Precipitation.
and run-off, nitrate nitrogen in, under controlled cropping systems, 309.
and temperature statistics, relation to rice and other crops, La. 729.
data, R.I. 729.

Rainfall—Continued.

- data, statistical analysis, 302.
- effect on nature of organic matter in prairie soils, 165.
- frequency determinations, station-year, reliability, 159.
- records and pumping, Fla. 675.
- seasonal distribution, relation to winter wheat yield, U.S.D.A. 189.
- semblance of, portable machine producing, Tenn. 542.
- summer, monthly sequence at Canadian stations, 302.

Raisin moth on grapes, U.S.D.A. 501.

Raisins, boron in, Ky. 852.

Ramie, fertilizer tests, Fla. 609.

Ramie fiber production, U.S.D.A. 46.

Ramie production tests, Fla. 609.

Rams, progeny testing, U.S.D.A. 35.

Ranch(es)—

- minimum sized, planning for Hyde County area, S.Dak. 550.
- organization and range land use, Oreg. 549.
- return on investment on, Wyo. 118.

Range(s)—

- carrying capacity, N.Mex. 231.
- carrying capacity estimates, Nev. 472.
- conservation practices for Great Plains, U.S.D.A. 231.
- fleeces, value, 382.
- forage, carotene, Ca, and P analyses of, Ariz. 651.
- grasses, *see* Grass(es).
- grazing capacity ratings, computing, method, Nev. 338.
- improvement, Wyo. 43.
- improvement by destruction of cactus, Colo. 512.
- improvement with better varieties of grass, Utah 613.
- land, arid, reseeding tests, N.Mex. 613.
- land of southern Arizona, infiltration capacities, U.S.D.A. 164.
- plants for jack rabbits, preferences and nutritive value, Ariz. 651.
- plants under cultivation, economic value, Ariz. 608.
- plants, water requirements and fertilizer tests, Ariz. 608.
- reseeding, effect of nurse crops, Utah 614.
- restoration, N.Mex. 183.
- vegetation surveys, Wyo. 43.

Ranunculus, North American subdivisions, 315.

Raspberry(ies)—

- ascorbic acid in, 424.
- black, anthracnose resistant, breeding, Iowa 190.
- black, diseases, studies, Kans. 65.
- breeding, Tenn. 477, Wash. 477, West. Wash. 478.
- crown gall, relation to subterranean insects, Minn. 643.
- disease control, Md. 205.
- freezing, varieties for, N.Y.State 847.
- frozen-pack, vitamin C in, Wash. 556.

Raspberry(ies)—Continued.

- mosaic, control, West.Wash. 488.
- mosaic, possible vectors in Great Britain, 219.
- pest new to North America, 785.
- shoots, breaking, associated with out-of-season cold, U.S.D.A. 628.
- varieties, Wis. 478.
- variety and cultural studies, Tenn. 477.
- variety tests, Ky. 761.
- winter injury, relation to mulching and fertilizing, Ky. 761.
- winter protection for, Kans. 48.

Rat(s)—*see also* Rodent(s).

- aging, nutritional problems, 848.
- colony, small, care of, 715.
- eating habit and fasting metabolism, 271.
- embryonic sexual development, effect of combined oestrogens and androgens, 749.
- female, failure of cyclic mating behavior in, 603.
- flea, oriental, established in Kansas, 511.
- house, studies, 639.
- hypophysectomized, ovarian and uterine weights, effect of stilboestrol and Antuitrin-S, 469.
- litter mates, resemblance of body, adrenal, and pituitary weights, 603.
- liver and adrenal androgen of, 749.
- lures, 640.
- nutrition, production and role of sterols in, Iowa 231.
- on deficient diets, skeletal abnormalities in offspring, 465.
- ovum, development, effect of delayed fertilization, 465.
- post-parturitional heat and time of ovulation in, 603.
- prostate and seminal vesicle grafts, relation to age and sex of hosts, 605.
- simple reaction time in, effect of age, hypophysectomy, thyroidectomy, and thyroxin injection, 38.
- stock colony, production of uniform experimental animals in, Iowa 268.
- suffering from fits, relation to vitamin B₆ deficiency, 856.
- thymectomized, growth and development of six generations, 335.
- tissues on diet extremely low in phosphorus, 561.
- vitamin E-low, successive generations, 36.

Rayon, descriptions and photomicrographs, 141.

Red mite—

- avocado, of California, a new species, 381.
- citrus, DN-Dust for control, 640, 650.
- citrus, effect of temperature and season, 380.
- control, 86.
- European, control, 86, 375, 643.
- European, on apples, 230.

Red scale, California—

- bacterial pathogen of, 791.
- fumigation, Calif. 222.

- Red scale, California**—Continued.
hydrocyanic acid fumigation, inheritance of resistance to, Calif. 223.
- Red scale, citrus**, bacterial pathogen of, 781.
- Red spider**—
control, La. 761.
control in greenhouse, Mass. 787.
on cotton, control, 502.
on walnut, control, Calif. 83.
toxicity of methyl bromide to, 515.
- Red squill**—
powder and extract, toxicity for chickens, rabbits, and guinea pigs, 644.
research, Mass. 787.
toxicity, factors affecting, 376.
- Redbud**—
aphid, studies, Kans. 84.
canker, N.J. 78.
leafhoppers, studies, Kans. 84.
whitefly, studies, Kans. 84.
- Redtop, fertilizer tests**, Fla. 609.
- Reed canary gra**
for control of whitetop and other weeds, Nev. 472.
pastures, yields and grazing days from, Wis. 522.
- Refrigeration**—
as used with pasteurization, 393.
units and cooler, walk-in type, Wash. 542.
- Refrigerator cars as farm storages**, Mich. 545.
- Regenometer**, new dark adaptation instrument, operation, 564.
- Rennin**, purification and chemical nature, 814.
- Reproduction**—
in rats, effect of pro-oxidants on, 334.
role of nutrition in, 328.
- Reproductive**—
organs, growth in rabbit, 181.
process and thymus, relation, 608.
system of male rats, regressive changes induced by stilboestrol, 606.
- Resazurin reduction in milk and aqueous solutions**, 395.
- Rescue grass smut in Arkansas**, U.S.D.A. 628.
- Research**—see also Agricultural research.
industrial, in United States, editorial, 433.
project, scope of cooperation solicited on, W.Va. 689.
- Reservoirs, sedimentation in**, relation to land use, Tex. 448.
- Respiration**—
of citrus fruits, relation to metabolism of fungi, 744.
studies with plants, direct-reading flow-meter for, 28.
- Rhabdoenemis obscura**, see Sugarcane weevil, New Guinea.
- Rhabdometra nulloollis** in prairie chickens and sharp-tailed grouse, 406.
- Rhabdopterus praetexta** new in Missouri, 502.
- Rhagoletis**—
cingulata, see Cherry maggot.
completa, see Walnut husk fly.
pomonella, see Apple maggot and Blueberry maggot.
- Rhipicephalus sanguineus**, see Dog tick, brown.
- Rhizobium**—
action on tissue containing selenium, 174.
meliloti bacteriophage in soils, 19.
meliloti, geographic distribution, relation to environment, Nebr. 734.
meliloti, physiologic studies, 592.
spp., dehydrogenase systems of, 452.
spp., use of carbohydrates and sugar acids by, 316.
strains on Leguminosae, symbiotic promiscuity in, 316.
- Rhizoctonia**—
damping-off, Hawaii 205.
diseases of vegetables, control, Fla. 629.
infection of potatoes, effect of agronomic practices on, 493.
root rot of sweetclover, 634.
seed disinfection for, Fla. 629.
solani, sugar beet and potato isolates, comparison, 67.
solani virulence in steam sterilized and natural soil, 67.
- Rhizopus**—
sexualis n.comb., morphology, cytology, and sexuality, 460.
soft rot of sweetpotatoes, symptoms and control, 776.
suis spores, germination and morphology, effect of ultraviolet radiation, 324.
- Rhode Island College**, notes, 719.
- Rhode Island Station**, report, 864.
- Rhodes grass v. Sudan grass as dairy roughages**, Hawaii 238.
- Rhododendrons**—
injured by freak weather, 371.
propagation by stem and leaf-bud cuttings, 62.
- Rhopalosiphum**—
prunifoliae, see Apple grain aphid.
pseudobrassicae, see Turnip aphid.
sp., vector of abaci mosaic, 789.
- Rhopobota**—
naevana, see Fireworm, black-headed.
naevana ilicijoliana, control, West. Wash. 503.
sp., notes, 643.
- Rhubarb**—
ascorbic acid in, 424.
breeding and forcing, West.Wash. 478.
crown rot disease, cause, 363.
culture, Tenn. 477.
- Rhyacionia frustrana**, life history and control, 794.
- Ribes petiolare** in California, relation to blister rust, 373.
- Ribes** populations, sampling in blister rust control work, 373.
- Ribodavin**—
annotated bibliography, 703.
biological assay, 584.
deficiency, endemic, in infants and children, 421.
deficiency in a child, cure by specific treatment, 570.

Riboflavin—Continued.

- deficiency in rat, *d*-amino acid oxidase in tissues, 275.
- deficient diets, ocular symptoms of, 858.
- determination, rat assay method, 297.
- dietary, effect on riboflavin in chicken tissue, 274.
- in bee bread, 228.
- in blood and muscle of normal and malnourished humans, 274.
- in blood and urine, 275.
- in chick starting rations, Vacatone as source, West.Wash. 518.
- in chicken meat, effect of cooking, 857.
- in Colorado-grown head lettuce, 427.
- in dried milk products, 298, 384.
- in milk, effect of diet, 100.
- in normal and cirrhotic liver, 420.
- in poultry feeds, 235.
- in rumen contents of livestock on vitamin-low diets, 94.
- increase in feces of fowls, organism responsible for, 390.
- methods for determination and study, 152.
- physiologic activity and clinical use, 703.
- synthesis by staphylococci, 461.

Rice—

- and byproducts, feeding value for livestock, La. 801.
- breeding, La. 752.
- breeding, noteworthy results, Calif. 40.
- cooked, composition and energy value, 691.
- cooking quality and method for testing samples, 122.
- culture experiments, Calif. 40.
- diseases, U.S.D.A. 211.
- diseases in Louisiana, La. 772.
- dwarf disease, studies, 643.
- fertilizer tests, Tex. 758.
- in storage, insects attacking, U.S.D.A. 505.
- in world agriculture and consumption, 681.
- inheritance of reaction to *Helminthosporium* and *Cercoaspora*, U.S.D.A. 175.
- noctuid pest in Costa Rica, 646.
- red and white-tested, composition and vitamin C in, 570.
- rotations and continuous planting, La. 752.
- species, reaction to *Phicurlaria oryzae*, 206.
- stem rot fungus, longevity of sclerotia, 70.
- sulfur studies, La. 752.
- varieties, sterility and aberrant chromosome numbers in, 601.
- wild, *Septis* larvae attacking, 217.
- yield, effect of Italian ryegrass and residual effect of calcium arsenate, La. 752.

Rickets—

- and cereals, 279.
- effectiveness of sunlight in Tucson for, Ariz. 281.

Rickets—Continued.

- in chickens, effect of sulfur feeding and accessibility to sunlight, Wis. 516.
- in laying pullets fed sulfur, 286.
- in premature infants, prevention, 137.
- in silver fox pups, 404.
- late, potency of vitamins D₂ and D₃ in, 711.
- low calcium, in guinea pig, 93.
- therapy, 712.
- treatment with minimal viosterol dosage, 137.

Rictularia ondatrae, new in muskrat, 374.

Rinderpest—

- complement-fixation reaction in, 528.
- virus, experimental infection in rabbit, 529.
- virus in rabbit, experimental infection, 528, 529.

River measurement, *see* Stream measurement.

Road(s)—

- and schools, condition and problems, Iowa 262.
- bases and subgrades, frost action in, 258.
- Robber flies of Colorado, 510.
- Roche 202, effect on rooting of plant cuttings, 318.

Rock weathering in Hawaii, U.S.D.A. 14.

Rocky Mountain spotted fever tick, hereditary transmission of western type of equine encephalomyelitis virus in, 254.

Rodent(s)—*see also* Mice and Rat(s).

- and other animal pests, control in Oregon, 788.
- and rabbits, identification by fecal pellets, 499.
- damage to tree plantations in Minnesota, 788.

Romalea microptera, *see* Grasshopper, eastern lubber.

Roosters, fertility in, Md. 178.

Root(s)—

- crops, B deficiency in, B.I. 753.
- intact and isolated, comparison of water intake rates in contiguous regions, 454.
- knot nematode—
 - control, chloropicrin for, N.J. 783.
 - effect on tomato wilt, 778.
 - infestation, plants resistant to, U.S.D.A. 631.
 - life history, 865.
 - parasitism in leaves and stems, 681.
 - resistance of tomato, seedling test method for, 782.
- nodule bacteria, adaptation to substrates, 82.
- nodule bacteria, growth-factor requirements, 32.
- nodule formation in legumes, 452.
- rot, southern, Calif. 65.
- structure, effect of root media on, Mass. 739.

Rootstocks—

- resistant to nematodes and to oak root fungus, Calif. 65.
- uniform, growing and development of new ones, Iowa 190.

Rose(s) —

- black spot control in Texas, 371.
- black spot, dormant, control, 371.
- dieback, 371.
- diploid species, crossing relations, 176.
- disease resistant red climbing, breeding, 498.
- diseases and new spray materials, 371.
- diseases, control, N.J. 215.
- greenhouse, toxicity of methyl bromide to, 515.
- mosaic and streak diseases, 215.
- mosaics, studies, Calif. 65.
- pedicel necrosis, 371.
- plants, removal of leaves at time of digging, Oreg. 201.
- soil and fertilization studies, 200.
- soilless culture, maintenance of effective nutrient levels, 200.
- Souvenir, effect of native humus on, 62.
- spray schedule for insect control, Mich. 643.
- stocks, breeding and testing, Iowa 190.
- testing and propagation, Fla. 619.

Rosellinia root rot of apple, pear, and ornamentals, Calif. 65.

Rotation of crops, Fla. 609, Ind. 751, Miss 337, R.I. 753, Wash. 471, Wyo. 43.

Rotation of crops, effect on yields and soil composition, Kans. 13.

Rotenone—

- biological action on lake fauna, 641.
- effect of alkaline carriers on, Wis. 503.
- in solution, effect of solvent, West. Wash. 503.

Rothamsted memoirs on agricultural science, 480.

Roughage(s)—

- effect on color and flavor of milk, 242.
- for cows, comparison, Iowa 238.
- nutritive value, 391.
- output, greater, in corn belt, effect, 548.
- program in herd management, 519.

Roundworms in horses, Calif. 104.

Royal jelly, composition, Fla. 691.

Rubber—

- consumption by the source plant, 456.
- regulation, U.S.D.A. 679.
- stoppers, adhered, removal, 585.

Rubus—

- caesius*, genotypic differences between races, 463.
- genus, in North America, 315.
- in Great Britain, possible vectors of mosaic on, 219.

Rudbeckia, length of day and temperature effects, 29.

Rum, Jamaica type, manufacture in Puerto Rico, 444.

Rumen contents, chemical changes with and without urea, 100.

Ruminants, rumen gases and bloat in, 320.

Run-off—

- and erosion, effect of plant cover, Wash. 445.
- and erosion from different soil types, S.C. 13.

Run-off—Continued.

- and rainfall, nitrate nitrogen in, under controlled cropping systems, 309.
- based on snow surveys, quantitative forecast system, 159.
- control with drainage or channel-type terrace, U.S.D.A. 258.
- effect of contour cultivation, 302, 733.
- from agricultural watersheds, tillage practices for, Wash. 445.
- sampling and measuring device, Tenn. 542.

Rural—

- life studies, meaning and usefulness of processes in, 840.
- organizations, effectiveness, Iowa 265.
- planning, social and community organization aspects, 843.
- population in Kansas, social well-being, Kans. 121.
- relief, relation to tenure and soil class, Tenn. 555.

Rushes, occurrence and economic importance, N.Dak. 754.

Russula emetica, cytological observations, 169.

Rust(s) —

- frost, or drought injured seed, relative values, 71.
- fungi, action of organic compounds as spray against, 359.
- fungi in Oklahoma, hyperparasites attacking, 357.
- fungicides for, Calif. 65.
- fungus, new genus and species, description, 68.
- new, from America and Africa, 23.
- of Florida, 171.

Rutabagas, *see* Swede(s).

Rye

- as winter pasture v. sorghum-corn silage for dairy cattle, Tenn. 521.
- boron in, Ky. 852.
- breeding, Wash. 471.
- culture experiments, Tenn. 470.
- cytoplasmic inclusions in glandular epithelium of scutellum, 169.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- fertilizer tests, Wis. 472.
- formation of vegetative and generative organs in, under slow development, 459.
- growing, freezable water and oxygen respiration in, 170.
- hybrids, smut and rust resistance, inheritance of, Wash. 471.
- in ration of laying hens, Wyo. 93.
- leaf rust, in North Dakota, N.Dak. 771.
- pasturing in fall, effect on yields next spring, Wyo. 43.
- silage, *see* Silage.
- smut infection and development in host, 633.
- variety tests, Ind. 751, S.C. 42, Tenn. 470, Wash. 471.
- wheat, barley, and oats, comparison of yields, Tenn. 470.

Eye—Continued.

- wheat hybrid, restitution of fertility in, 462.
- winter, value for silage, B.I. 810.

Rye-grass—

- blind seed disease, 73, 363.
- perennial, strain tests, Mass. 752.
- perennial, vegetative growing points, studies, 43.
- varieties as green manure and cover crops, Mass. 752.

Saccharomyces cerevisiae, action of acetic acid on, 156.

Saccharum genus, chromosome numbers in, 327.

Safflower—

- new pest of in India, 89.
- oil content measurements, Idaho 724.
- production tests, N.Mex. 753.
- tests, N.Mex. 183.
- variety tests, Ariz. 608.

Sagebrush removal as range improvement measure, Wyo. 43.

Salmon meal, effect on egg flavor, Wash. 516

Salmonella—

- abortus-equina*, live cultures for prevention of abortion in mares, 528.
- abortus-equina*, mares inoculated with, appearance of hemolytic streptococcus in vaginas, 528.
- aertrycke*, action of acetic acid on, 156.
- choleraesuis*, notes, Mich. 670.
- genus, differentiating members, cysteine and related compounds for, Calif. 818.
- group variants, method to obtain specific cultures from, 666.
- pullorum*—see also Pullorum disease.
 - susceptibility to, breed differences in, 748.
 - viability, Mass. 815.
- spp. and micro-organisms confused with them in foxes, 819.
- spp., comparative nutritional requirements, 398.
- spp., Kauffman-White classification, 532.
- type, new, from apparently normal hogs, 254.
- types, isolation, Mass. 815.
- typhimurium*—
 - from fatal cases of acute gastroenteritis in imported sheep, 528.
 - in poultry with transmission to man, paratyphoid enzooty caused by, 674.
 - virulence, 399.

Salmonellosis, abortion, in horses, 529.

Salt in livestock nutrition, 652.

San Jose scale on peach, control, U.S.D.A. 505.

Sand(s)—

- culture studies of use of saline and alkaline water in greenhouses, 484.
- dunes, black alder as pioneer tree on, 485.
- fine, moisture in, capillary rise and movement, 732.

Sand(s)—Continued.

- Norfolk coarse, residual fertility, effect of green manure and cover crops, S.C. 14.

Sandy—

- loam, Cecil, relative productivity of different horizons, 14.
- soil, Yuma mesa, properties, effect of Colorado River silt, Ariz. 591.
- soils as affected by soil reaction, availability of ions, 737.
- soils, value of lime for, Wis. 446.

Sap expression by low pressure, 597.

Sap pressure and oxidation, 172.

Sarcophaga cistudinis, parasite of box turtle, 83.

Sarcosporidiosis in black duck, 827.

Sardine meal as protein supplement for fattening pigs, S.C. 92.

Sausage tree, movement of organic solutes in, Hawaii 190.

Sausages, imported canned, examination, 411.

Sawfly—

- European wheat-stem, Iowa 218.
- hemlock, and parasites in Oregon, 230.
- on wheat, Kans. 84.
- wheat stem, development in various host plants as index of resistance, 91.

Scabies, psoroptic, in horses and carabao, derris root infusion for, 399.

Scale(s)—

- control by beneficial insects, Calif. 83.
- infestations on citrus during 1940, 506.
- insect(s)—see also Purple scale and Red scale.
 - dormant sprays for, Wash. 503.
 - on citrus, control, Calif. 83.
 - recently discovered in United States, U.S.D.A. 502.
 - studies, Ariz. 641, S.C. 84.
- scotch pine, sprays for control, Mich. 222.
- soft, control, West Wash. 503.

Scaptomyza vicina, see Changa.

Scarabaeid larvae—

- effects of two milky diseases on, 512.
- susceptibility to infection by type A milky disease, 512.

Schistocerca gregaria, studies, 644.

Schistosoma ova, giant toad as vector of in Puerto Rico, 82.

School districts, chart reporting taxable property, S.C. 118.

Scientific—

- method, social implications of, 840.
- research and development, Federal office of, editorial, 289.

Scilla campanulata disease due to stem and bulb eelworm, 216.

Scirtothrips citri, see Citrus thrips.

Sclerotinia macrospora, notes, 768.

Sclerotinia—

- fructicola* causing blossom blight and fruit rot of cherries, 214.
- fructicola* conidia, germination and toxicity of copper, [N.Y.] Cornell 207.

Sclerotinia—Continued.

laea and *S. fructicola*, brown rot of stone fruits due to, 779.

narcissicola n.sp. on narcissus, studies, 771.

polyblastia, studies, 771.

sclerotiorum on ornamentals in Maryland greenhouses, U.S.D.A. 357.

sclerotiorum pink rot of celery, Fla. 629.

sphaerosperma n.sp. on *Allium* sp., studies, 771.

spp. cause of brown rot of stone fruits, West.Wash. 488.

spp., effect of low temperatures on germinability and infectiousness of conidia, 67.

spp. pathogenic to potatoes, 210.

Sclerotium rolfsii—

growth and parasitism, Fla. 629.

in soils, fungicides for, Calif. 494. notes, U.S.D.A. 768.

Scolytus multistriatus, see Elm bark beetle, smaller European.

Screwworm(s)—

fly, infections and outbreaks in game animals and livestock, 89.

in man in Missouri, 502.

infestation of livestock, new remedy, U.S.D.A. 502.

prevention and eradication, ranch management for, U.S.D.A. 501.

secondary, toxicity of chemicals to, 510.

Scrotum of rat, thermoregulatory function, 37.

Scurvy, ascorbic acid, phosphatase, and calcium in blood of guinea pigs, 278.

Scutigrella immaculata, see Centipede, garden.

Sedges, occurrence and economic importance, N.Dak. 754.

Sedimentation rate, standardized technic for, 665.

Seed(s)—

agricultural, examination, Me. 477.

and seedlings, fertilizer injury, causes and prevention, Tenn. 471.

approved, production, Calif. 40.

dormant, treatment with growth substances, effect, 344.

dry, irradiating with soft X-rays, root modifications induced by, 745.

germination, calcium as factor, 321.

germination, effect of temperature, 355.

germination tests, control of mold in, N.Y.State 208.

germinative capacity, rapid determination, 595.

hypocotyl in, 31.

impressions on plastic films, 595.

injured by rust, frost, or drought, relative values, 71.

inspection, Ind. 761, Mass. 189.

marketing in Knoxville area, Tenn. 685.

nondormant, treatment with growth substances, effect, 344.

old, germination tests, 322.

Seed(s)—Continued.

stocks, preserving quality, N.Y.State 761. storage, Fla. 609.

toxicity of industrial gases to, 456.

treated for disease control, effect of storage on yields, Ill. 360.

treatment, response of growing plant and pathogen to, Iowa 205.

treatment with light, prolongation of viability by, 343.

viability, relation to temperature and humidity, 169.

weed, see Weed seeds.

Seedbeds for different crops, methods of preparing, Wyo. 43.

Seedlings—

development, effect of day length and temperature, 323.

response to wavebands of low intensity radiation, 457.

Segregation, somatic, 601.

Selenium—

affecting plant quality, Wyo. 105.

compound, chemistry and toxicity, 399. containing tissue, action of *Rhizobium* on, 174.

in soils and crops from them, U.S.D.A. 314.

in Utah forage plants, 252.

toxic action, effect of variations of dietary protein, 419.

toxicity to dogs, effect of arsenic, proteins, and thiamin, 825.

Self-sufficiency, studies, 239.

Semen—

bull, diluted and undiluted, longevity, fecundity, motility, and pH, 327.

bull, variations in, relation to fertility, 330.

bull, variations in, relation to use in artificial insemination, Mo. 330.

ram, motility and metabolism, 327.

seminal plasma, and bacteria in semen of boar, metabolic rates, 331.

Seminal vesicles in mice of C strain, duplication, 603.

Senescence, premature, and vitamins, 855.

Septic tank, intermittent discharge valve for, Mich. 676.

Septicemia, hemorrhagic, of cattle, newer developments in therapy, 321.

Septis larvae on wheat and wild rice, 217.

Septoria—

spit in Virginia, U.S.D.A. 628.

lactucae, notes, 66.

sp., role in canker and dieback of brambles, Idaho 769.

Sericea—

grazing value, Tenn. 471.

height and frequency of mowing, Ala. 470.

tannins in, S.C. 105.

Sesame products, effect on antler growth in deer, 652.

Seurocyrnea colini in grouse, 405.

Sewage—

bacteria beds, *Psychoda* species in, abundance and size, 377.

sludge, fertilizing value, Ohio 450.

Sex hormones, *see* Hormone(s).

Sex ratio in chickens, 329.

Sexual maturity in rats, age of, effect of oat juice extract, 519.

Shark-liver oil as source of vitamin A for poultry, Fla. 651.

Sheep—*see also* Ewe(s) and Lamb(s).

Australian Merino rams × Rambouillet ewes, fleece quality, Wyo. 93.

botfly, *see* Botfly, sheep.

breeders, scoring system for, 95.

breeding problems, 604.

Corriedale and Rambouillet, growth under range conditions, 382.

Corriedale, breeding, Wyo. 93.

Corriedale-native grade, value, Miss. 383

crossbred Columbia, performance, Fla 604.

disease, new diagnosed by station, Colo. 822.

diseases and parasites, 380.

effects of inbreeding and line breeding, Kans. 92.

embryos and fetuses, relative development of exterior characters in, 328.

fed vitamin-low diets, vitamins in rumen contents, 94.

Hampshire, early development, breeding practices in, Iowa 176.

helminth parasites in, Va. 669.

income, factors affecting, Colo. 683.

individual fleeces, value, effect of shrinkage and grade, Wyo. 93.

internal parasites in, and rotational grazing, Fla. 665.

iodine in nutrition of, 234.

Karakul, exterior characters, relation to fur quality of young, 323.

Northumbrian, blood copper of, 668.

on natural grazing, dry matter consumption, 233.

on natural grazing, use of proteins at different seasons, 233.

parasites, Calif. 104.

parasites, gastrointestinal, control, 109.

parasites, phenothiazine as vermifuge for, S.C. 105.

parasites, treatment with repeated doses of phenothiazine, 535.

parasitic diseases, anthelmintic medication and phenothiazine, 664.

production, breeding, and management, 386.

quality rating, discriminant function applied to, 382.

Rambouillet and Corriedale, comparison, 38, 382.

range castration of, Ariz. 664.

range, wool and lamb production in, from rams and ewes of different breeds, N.Mex. 231.

reproduction, relation to vitamin E. 385.

Iowa 231.

Sheep—Continued.

role of vitamin E in growth, 385.

skin temperature under winter conditions, 385.

strongyles, behavior of infective larvae, 818.

toxicity of lead arsenate and spray residues to, Wash. 527.

wheat feeding experiments, Oreg. 802.

wrinkles on skin, prenatal development, 328.

Shelterbelt(s)—

in Great Plains, longevity and growth, snowdrifts as factor, 587.

protective value, effect of natural pruning, 486.

trees, growing and distribution, Wyo. 48.

Shipping fever of feeder cattle, Kans. 104.

Shrub(s)—

chlorine gas injury, 208.

diseases, control, 372.

fertilization, Ohio 765.

for conservation and erosion, hillculture studies, Iowa 257.

for farm and shelterbelt planting, Wyo. 62.

freak weather damage to, 729.

ornamental, care of, Miss 624.

range reseeding trials with, N.Mex. 613.

sycamore mite injurious to, 650.

tropical, propagation by leaf-bud cuttings, 197.

Sickness and medical care of rural population in petroleum-producing area, Ark. 843.

Sieve tubes in Monocotyledoneae, structure, 169.

Silage(s)—

alfalfa-molasses, for fattening steers, Pa. 803.

alfalfa, preservation, 241.

corn, digestibility by cattle and sheep, 238.

corn, for steers, Wyo. 93.

corn, hybrid v. open-pollinated, Wis. 522.

corn, settled in a silo, estimating quantity, U.S.D.A. 409.

corn-sorghum, v. rye and crimson clover for dairy cattle, Tenn. 521.

corn, studies, 382.

corn v. grass, for cows and heifers, Mass. 809.

grass, feeding value for dairy cows, 656

grass, machinery for harvesting and storing, N.J. 545.

grass, preparation and nutritive value, 391.

grass, preservative, corn meal as, 519.

grass, studies, R.I. 810.

grass, use, types of legumes and grasses used, yields, etc., Mass. 830.

legume, studies, Tenn. 437.

methods of preserving, 651.

molasses-grass, chemical changes in, 232.

Napier grass, sorghum, and sugarcane, comparative feeding value, Fla. 651.

poisoning of feeder cattle, Kans. 104.

Silage(s)—Continued.

- preserving agents for making, comparison, Kans. 98.
- rye, palatability, Wis. 522.
- sorghum, v. legume hay for digestible nutrients and cost, Miss. 522.
- sorgo and Sudan, feeding value, comparison, Kans. 98.
- stack, losses and nutritive value, effect of type of construction, West Wash. 521.
- studies, chemical determinations useful in, 519.
- value for dairymen, Miss. 522.

Silica of Puerto Rico soils, P.R. 730.

Silk—

- filaments, density and swelling, relation to moisture in, 429.
- filaments, variations of shape and area of cross section, effect upon extensibility, 429.
- yarns, strength and elongation, effect of humidity, 283.

Silkworm, disposition of arsenic in, 793.

Silo(s)—

- of concrete staves, durability test, Minn. 676.
- sealed and unsealed, shrinkage in, 382.
- trench, for preserving heated cereals, 519.
- trench, length of time silage will keep in, Wis. 522.

Silver in biological material, 698.

Simulium meridionale, see Turkey gnat.

Siphonaptera species infesting wild hares and rabbits, key, 648.

Sire(s)—see also **Bull(s)**.

- Ayrshire, approved, program, 519.
- dairy, evaluation in New Zealand, 239.
- dairy, proving by cooperative lending plan, S.C. 98.
- proved, for dairy herd improvement, West Wash. 521.

Sirup, sorghum, clarification, use of clay for, Iowa 151.

Sitodiplosis cambriensis n.sp., description, 647.

Sitotroga cerealella, see Angoumois grain moth.

Skin milk—

- as replacement for grain in pork production, Wyo. 93.
- dried, detection and determination in meat products, 726.
- dried, in rations of chicks during coccidiosis, effect, 539.

Skin lesions in rat, relation to deficiency of vitamin B complex factors, 856.

Skin sensitization, cross, between *Pasteurella tularensis* and *Brucella melitensis*, Mich. 530.

Skunks, life history, ecology, and management, Iowa 217.

Slip covers for furniture, U.S.D.A. 285.

Slope aspect, effect on climatic factors, 301.

Slug(s)—

- baits, metaldehyde and calcium arsenate in, 502.
- metaldehyde tests for, Calif. 84.

Smicronyia utilis, morphology and life history, 793.

Smoke-column visibility, theoretical analysis, 486.

Smut—see also *Grain smuts and specific hosts*.

- factors affecting resistance of strains to, Iowa 205.

Snail(s)—

- baits, metaldehyde and calcium arsenate in, 502.
- control in orchards, 374.
- fresh-water, as intermediate hosts of liver fluke, control, 535.
- giant toad as distributing agent, 83.
- hosts of flukes, biological control, Hawaii 247.
- metaldehyde tests for, Calif. 84.

Snaptadragon(s)—

- breeding, Mass. 762.
- rust resistance, tests, Calif. 498.
- seed germination and seedling anatomy, 460.

Snow—

- and ice, lists of current publications, 303.
- average depth, distribution in New York and New England, 302.
- committee, report, 159.
- storage and melting, effect of lodge-pole-pine forest, 302.
- Survey Conference, Western Interstate, papers, 158, 587.
- survey systems, western, map, 159.
- surveying, Nev. 444.

Snowdrifts, factor in growth and longevity of shelterbelts in Great Plains, 587.

Snowfall, Kansas, 302.

Soap(s)—

- from gum rosin, color, 156.
- potassium, of wood rosin, 504.
- rosin and fatty acid-rosin, detergent action, 233.
- solutions, rosin, surface tension, 295.

Social—

- change in South Dakota, basic trends, S.Dak. 690.
- planning, local, long-time experiment in, 121.
- processes, concept, meaning and usefulness in study of rural society, 840.
- work, family, in rural areas, and public welfare, 843.

Sod webworms, studies, Kans. 84.

Sodium—

- arsenite, herbicidal behavior, Calif. 618.
- chlorate, herbicidal behavior, Calif. 618.
- chlorate mixtures, properties and action, Iowa 205.
- fluoride, testing toxicity to American cockroaches, 87.
- fluoride, water-ingested v. food-ingested, effects, 129.

Sodium—Continued.

o-phenyl-phenate as disinfectant for oranges, 478.

Soil(s)–

acid, exchangeable base level, minerals of silt fraction as contributors, 310.
acidity at various depths, relation to lime treatment, 311.

acidity, effect of crops, R.I. 730.

acidity in orchards, relation to spray materials, Mass. 762.

adaptability and fertility, West.Wash. 446.

aggregates, water-stable, determination. 446.

aggregates, water-stable, new sedimentation tube for, 304.

aggregation—

and water percolation in Salt River Valley. Arizona, 731.

changes in, factors affecting, 163.

effect of crops and organic materials. 304.

factors affecting, Kans. 13.

of Dunmore silt loam. effect of cropping and fertilizer practices, 448.

variations in state and stability, 305.

alkali, *see* Alkali.

analysis, development and evaluation of methods, Fla. 589.

analysis, rapid micromethods, Fla. 590.

analysis, ultramechanical, apparatus for, 761.

and crop management for southeastern New York, [N.Y.]Cornell 20.

and crop management, systems of, nitrogen economy, Ala. 445.

and crop problems, studies, 589.

and security, U.S.D.A. 590.

and water conservation—

in Great Plains, 17, U.S.D.A. 165.

research, pioneer in. 160.

studies, 257, Iowa 160.

and water losses, Idaho 729.

area, Wisconsin drift, effects of amounts of fertilizers at different times in rotation, Iowa 160.

arid western, ion and plant relations in, 737.

bacillus, bactericidal agent extracted from, 248, 249.

bacillus cultures, chemical properties of bactericidal substances from, 249.

bacillus cultures, fractionation of bactericidal agent from, 249.

bacteria—

fluctuations in numbers, 18.

numbers, accuracy of determination, relation to method of sampling, 734.

nutritional requirements, 19.

producing bactericidal agents, isolation, 734.

bacterial equilibrium, basis for determining, 19.

Soil(s)—Continued.

base-exchange capacity and related characteristics in Connecticut, 447.

base saturation, Hawaii 160.

bog, *see* Bogs.

classification, new nomenclature of higher categories, 161.

classification, recent trends in. 161.

clods and crumbs, size distribution, determination, 15.

color, significance, origin, and classification, 304.

complexes of California, hardpan and microrelief in, U.S.D.A. 307.

concept of available nutrients in. 735.

conditions, effects of fertilizers, Iowa 160.

conservation—

farm management for, W.Va 331.

for farms, formulation and operation of planned program, Iowa 262.

on farms and wildlife management, U.S.D.A. 500.

practices in Adair County, Iowa 160.

program and beekeepers, 380.

Service, work of, U.S.D.A. 590.

correctives and plant nutrients, crowbar method of applying, 191.

corrosion cells, electrode potentials in, measurement, 407.

dispersion for mechanical analysis, sodium metaphosphate for, 304.

dry-farm, losses of nitrogen and organic matter from, 16.

dynamic properties applied to implement design, Ala. 542

eroded, fertilizing planting stock on, 63.

erodibility, Wash. 445.

erosion—

and related land use conditions, U.S.D.A. 733.

and run-off, effect of plant cover, Wash. 445.

and run-off from different soil types, S.C. 13.

by wind, relation to dry aggregate structure of soil, 590.

by wind, relation to size and nature of exposed area, 590.

control from agricultural watersheds, tillage practices for, Wash. 445.

control, relation to cropping practices, Wash. 445.

effect of close growing cover crops, Miss. 448.

effect on activity, number and kind of soil organisms, 733.

effect on soil and crops, Wis. 446.

general cause and effects in world and in United States, U.S.D.A. 590.

location, kind, and seriousness in State, R.I. 733.

microscopic studies on, Iowa 160.

Soil(s)—Continued.

erosion—continued.

relation to properties of soils, Iowa 160.

sheet, relation to structure of Duffield silt loam, 164.

studies, Iowa 160, Tenn. 445.

wind, factors affecting, Mass. 729.

exchange capacity, relation to K fixation, 310.

exchangeable bases in, determination by Lundegårdh spectrographic method, 309.

fertility—

determination, quick methods, Fla. 589.

effect of soil nitrogen, 736.

forest, effect of stand composition on nitrogen transformation in, 309.

importance of clay and organic matter fraction in, 165.

losses, effect of fallow, Kans. 754.

management, efficiency, Md. 160.

studies in Willamette Valley, Oreg. 730.

survey, 592.

from major groups, sedimentation volumes, 306.

fumigant applicator, new, Calif. 115.

gas and vapor movements in, 15 greenhouse, equipment for sterilizing, Ky 786.

horizons, compact, practical significance, 307.

humus-forming materials in, decomposition, Iowa 160.

injury from calcium arsenate, S.C. 84.

inoculation, *see* Legume(s), inoculation.

irrigated, changes occurring in, Wash. 445.

irrigated, fertility, Wash. 445.

lime requirements, 739.

limed, changes of superphosphates in Tenn. 593.

losses from cultivated strips in strip-cropped fields, U.S.D.A. 17.

measurement, structural stability and permeability, 163.

microbiological activity, effect of sheet erosion, 733.

microbiology of, basic principles of study, 32.

minerals, solubility and base exchange properties, effect of grinding, 305.

moist, thermal conductivities in, 308.

moisture—

and capillary tension, relation to capillary conductivity, Iowa 160.

and tillage studies, Wash. 471.

and winter wheat in Kansas, 336.

as limiting factor for absorption and root pressure, 743.

changes, electrothermal method for following, 307.

control, use of avallameter in, 732.

Soil(s)—Continued.

moisture—continued.

determination, dielectric method, 307.

determination, use of electrical resistance method, 591.

equivalent, determining, methods, 732.

in crop production, Kans. 753.

maintaining below field capacity, greenhouse method, 732.

measurement, field apparatus for, Iowa 160.

meter, development, Ariz. 589.

rapid detection, 48.

relation to degree of dispersion, 307.

relations in peach orchards, S.C. 43.

sorption curves for Iowa soils, 308.

storage, effect of seedbed preparation, Kans. 753.

storage, use, and evaporation, Kans. 13.

studies, 591.

studies for forecasting run off from snow cover, 159.

studies, use of wilting coefficient in, 591.

muck, *see* Muck.

Natal coastal, concretions and refractory deposits in, 446.

nitrogen content, *see* Nitrification and Nitrogen.

of Florida, micro-organisms in, types and distribution, Fla. 589.

of Idaho, base-exchange capacity, Idaho 729.

of Kansas, replaceable cations and anions in, Kans. 13.

of Massachusetts, lime requirement, Mass. 729.

of Puerto Rico, chemical data, P.R. 730.

of Puerto Rico, composition, P.R. 730.

organic matter in, *see* Organic matter.

permeability, relation to pore-size distribution, 306.

pH at low moisture content, 16.

pH, determining, Ariz. 589.

pH, effects of basic materials, Fla. 590.

physical characteristics, 406.

Podzol, in Southern Appalachians, 162.

porosity, relation to gas and water movement, 732.

potash required to maintain constant level, Ala. 445.

Prairie and Gray-Brown Podzolic, differences in aggregation, 731.

preparation, erosion, cultivation, Miss. 336.

productive capacity, estimating, 312.

profile(s)—

development in Hawaii, U.S.D.A. 14.

gleisation in, 163.

Iowa, organic phosphorus in, 449.

of desert soils, effect of irrigation and cropping, N.Mex. 161.

podzolic, organic and inorganic fractions, base-exchange capacity, 162.

Soil(s)—Continued.

profile(s)—continued.

samples, monolithic. method for taking and mounting, 304.

properties, effect of fire heating, 16.

properties, effect of organic-matter decomposition, Ariz. 589.

puddled, moisture relations in, Ariz. 589

rate of leaching. effect of green manure and cover crops, S.C. 14.

reaction, meaning of, 781.

reaction within and outside area of tree spread, Fla. 590.

relation to yield and quality of crops. Fla. 589.

research, Calif. 13.

salinity, Pecos River joint investigation. U.S.D.A. 310.

semiarid, oxidation-reduction potentials. Ariz. 589.

series names, new, 161.

solutes, upper movement, 453.

solution studies, Kans. 13

sterilization—

by chloropicrin, 312.

by steaming and with chloropicrin. R.I. 753.

plat tests with chemical sterilants. Calif. 618.

survey in—

Alabama, Sumter Co., U.S.D.A. 590

Arizona, Casa Grande area. U.S.D.A. 590.

Arizona, Yuma Desert area, U.S.D.A. 303.

California, Visalia area, U.S.D.A. 303.

Georgia, Hall Co., U.S.D.A. 303.

Iowa, Jackson Co., U.S.D.A. 303.

Michigan, Ingham Co., U.S.D.A. 590.

Minnesota, Pine Co., U.S.D.A. 590

Nebraska, Cass Co., U.S.D.A. 303

North Carolina, Clay Co., U.S.D.A. 590.

Oklahoma, Pontotoc Co., U.S.D.A. 303.

Oklahoma, Washita Co., U.S.D.A. 303.

Tennessee, Jefferson Co., U.S.D.A. 730.

Virginia, Isle of Wight Co., U.S.D.A. 303.

temperatures, value of mean and average 308.

test, rapid, 1-gram ball resistance test. 163.

tests, rapid. R.I. 730.

testing methods and apparatus, 735

types of Iowa, characteristics, Iowa 160 |

unproductiveness following removal of trees, Wash. 445.

volume change, relation to infiltration rates, 447.

water, see Soil moisture

waterlogged and eroded, microbiological status, Iowa 160.

Soil(s)—Continued.

waterlogged, nitrate fertilizer additions relation to oxygen deficiency, 449.

webworm, studies, Kans., 84.

Solanine, potato, factors affecting synthesis and distribution, 170.

Sorghum—

and corn production, competition in, Iowa 263.

as feed for dairy cows, deficiencies of, Kans. 98.

breeding for disease resistance in, Kans. 65.

diseases, Kans. 65.

fallow methods for, Kans. 753.

full-grown frosted, nontoxic effect, Wis. 522.

grain—

breeding, Kans. 40.

culture experiments, Kans. 40.

dry-land culture, U.S.D.A. 183.

harvesting, efficiency of combine for, Kans. 116.

palatability as fodder feed, Kans. 40.

quality during farm storage in different types of bins, Kans. 41.

variety tests, Ariz. 181, 608, Fla. 608, Hawaii 182, Idaho 751, Kans. 40, La. 752, Md. 182, N.Mex. 183,

753, S.C. 42, Wash. 471, Wyo. 43.

wet milling, production of starch by, Kans. 5.

yield, effect of vetch and fertilizer treatments, La. 752.

yields per acre on straight-rowed and contoured fields, N.Mex. 263.

grains, value in poultry ration, Colo. 806.

midge, biology and control, U.S.D.A. 647.

silage, see Silage.

sirup clarification, use of clay for, Iowa 151.

sirup, valuable in diet as source of iron, copper, Miss. 412.

stover, fresh v. aged, palatability, Kans. 98.

varieties, reaction to smuts, 363.

wild, variation of prussic acid in, 252.

yields, effects of fallow, Kans. 754.

yields, effect of loss of soil moisture by evaporation, Kans. 41.

yields, relation to soil moisture at planting time, Kans. 753.

Sorgo—

breeding, Kans. 40.

culture experiments, Kans. 40.

dry-land culture, U.S.D.A. 183.

fertilizer tests, Ky. 751.

freshly cut Atlas, carotene distribution in, Kans. 98.

grain, ground and unground, use, Kans. 98.

palatability as fodder feed, Kans. 41.

sirup, studies, Tenn. 437.

Sorgo—Continued.

variety tests, Ariz. 608, Fla. 608, Idaho 751, Kans. 40, Ky. 751, La. 752, N.Mex. 183, 753, S.C. 42, Wyo. 43.

Sorosporium syntherismae cultures, variation in, 771.

South Carolina Station, report, 143.

South Dakota College, notes, 144.

South Dakota Station, notes, 144.

Sows—see also Pig(s) and Swine.

brood, vitamin deficiencies in ration, 362
productivity, predicting record of, Iowa 176.

Southistle, perennial, control experiments, Wash. 471.

Soybeans(s)—

adaptation studies, Iowa 182.

analyses, Tenn. 437.

Biloxi, floral initiation in, 28.

breeding, Iowa 182, Miss. 337, N.Mex 183.

canning tests, Iowa 268.

cultural and interplanting tests, Ariz. 608.

culture experiments, Fla. 609, Kans. 40
culture for seed and hay, N.Dak. 184.

edible, Miss. 470, Wis. 473.

fertilizer tests, S.C. 42.

flour, antioxygenic fraction in, 101.

in diet, Tenn. 557.

in New Hampshire, N.H. 46.

in nutrient solution, oxidant produced
by, nature of, Mass. 739.

inoculation studies, La. 752.

insect enemy of, 645.

iodine number, rapid determination,
U.S.D.A. 6.

meal for pigs, Mich. 234.

meal v. whole soybeans for fattening
calves, Ohio 803.

oil(s)—

content, rapid determination,
U.S.D.A. 6.

high iodine number, composition.
293.

meal, effect on avian reproduction,
389.

meals for pigs, Ohio 517.

press cake, protein extraction, Miss.
292.

smoke, flash, and fire points of, 157
spectral transmittance, 294.

Otootan and Biloxi, and cowpeas for hay,
comparison, S.C. 42.

raw and cooked, effect of cystine and
methionine on proteins of, 93.

response to trace elements on peat and
muck, Fla. 609.

root nodules, effect of potash and phos-
phoric acid nutrition, 317.

seedlings, effect of calcium ion and its
antagonism to arsenic, boron, and
selenium ions, Mass. 729.

value for silage, R.I. 810.

varieties, response to rate and date of
planting, Iowa 182.

Soybean(s)—Continued.

varieties with successive maturity dates,
Miss. 470.

variety tests, Ariz. 181, 608, Fla. 608, Ind.
751, Iowa 182, Kans. 40, La. 752, Md.
182, Miss. 387, N.Mex. 183, 753, S.C.
42, Tenn. 470, Wash. 471, Wyo. 43.

vegetable-type varieties, range of adapta-
tion, Ill. 46.

virus control by resistant varieties, Ala.
487.

yellow-seeded, varieties and selections,
Del. 40.

Spanish moss, insects and spiders on, U.S.D.A.
501.

Sparrow—

chipping, insect food, 217.

testis, secretion of male hormone by, re-
lation to interstitial cell hyperplasia,
603.

Spathius citrolaus, parasite of cotton-stem
weevil, biology, 515.

Spearmint oil, economic analysis of produc-
tion, Ind. 834.

Specimens, demonstration, cabinet for stor-
age and mounting, 740.

Specularia perfoliata, flowering behavior, re-
lation to light, 323.

Sperm—

cell types in sheep, seasonal trends, 327.

cells, respiration, new portable equip-
ment for measuring, 327.

metabolism, effect of inhibitors and ac-
tivators, 468.

Spermatophytes of St. Bartholomew, U.S.D.A.
23.

Spermatozoa—

fertilizing capacity, effect of aging in
female genital tract of guinea pig,
180.

in rat female genital tract, duration of
functional life, 603.

motility, phospholipids as source of en-
ergy for, 749.

of dairy bull, storage, 657.

of fowls, viability under various condi-
tions, 467.

quiescence in vivo, relation to carbon di-
oxide tension, 36.

ram, respiratory activity and survival,
factors affecting, 37.

Sphaerotheca—

panici-millicae cultures, variation in, 771.

sorghi, germinating chlamydospores her-
itable lysis in, 67.

spp., notes, 363.

Sphaerotheca lanestris on coast live oak,
372.

Spices and spice oils, Mass. 724.

Spider, black widow, fertility, 800.

Spider mite, see Red spider.

Spiders on Spanish moss, woods trash, etc.,
U.S.D.A. 501.

Spinach—

boron in, Ky. 852.

carotene in, determination, 564.

Spinach—Continued.

- downy mildew infections, sporulation injury associated with, 771.
- dried, carotene in, determination, 441.
- fertilizers for, Wis. 478.
- glutamine and asparagine in, relation, R.I. 739.
- leaves, chlorophyll-protein compound, 597.
- leaves, chloroplast substance of, 595.
- seed treatment, Me. 620.
- varieties, Wis. 478.
- white rust in Texas, U.S.D.A. 204.

Spinal fluid, vitamin B₁ in, 183.

Spirochetosis, fowl, transmission experiments, 826.

Spit bugs, early dusting for, 86.

Spore staining, simple method, 529.

Sporobolus spp., germination, factors affecting, 754.

Spray(s)—see also Fungicides, Insecticide(s), and specific forms.

chamber, uses in plant experimentation, 169.

copper, see Copper.

equipment, stationary, operation costs, 52.

injury, Del. 65.

materials, relation to spray injury, Wash. 477.

materials, tests, Mass. 724.

oil, see Oil sprays.

preparation and use, Oreg. 762.

programs, 375.

residue, effect of growth and weathering, 53.

residue problem, Mass. 786, Me. 642.

residue removal, Wash. 477.

residue, toxicity to livestock, Wash. 527.

spreaders for, Me. 642.

tank-mix nicotine bentonite, clay used in, 219.

Spraying—

and dusting equipment, Calif. 115.

operations, efficiency of, 206.

vapor, equipment, experiments, U.S.D.A. 261.

Spruce—

beetle, eastern, detrimental or beneficial insect, 792.

sawfly, European—

biological control, 785.

mysterious disease of, 380.

new form in Canada, 91.

parasite of, U.S.D.A. 501.

seedlings, hardening, effect of potash salts, 766.

Sitka, specific gravity and strength, effect of heart rot fungi, U.S.D.A. 639.

Squab production, monthly standard for, N.J. 683.

Squash bug—

control, Idaho 786.

insecticides for, Me. 642.

on cucurbits, control, Wis. 503.

Squash vine borer, control, Mass. 787.

Squirrel(s)—

thirteen-lined ground, habits, 641.

western fox, ecology and management, Iowa 217.

Stablefly—

breeding places in Florida, 798.

false, in living nymphs of grasshopper, 88.

Stagonopora meli Wott, resistance of alfalfa and sweetclover to, 771.

Staining—

differentially, spores and vegetative cells of micro-organisms, solution for, 326.

of bacteria, nature of process, 326.

vegetative cells, 326.

Stallions, enrollment, Ind. 804.

Staphylococci—

and micrococci from milk, differentiation, 107.

of bovine mastitis, isolation and characteristics of bacteriophages for, 400.

synthesis of riboflavin by, 461.

Staphylococcal infections, effect of sulfonamide drugs in, 106.

Staphylococcus—

aureus, nutrition, effect of biotin, bios II₂, and vitamin H, 461.

pyogenes aureus, cause of pneumonia in calves, 401.

toxins, effect of sulfanilamide, sulfapyridine, and sulfathiazole, 656.

Starch(es)—

degradation, enzymic, characterization of products, Iowa 151.

iodine complexes, absorption spectra, Iowa 151.

Raman spectra, 151.

susceptibility to diastatic attack and protein films, 581.

wheat, fractionation and amylase hydrolysis, 580.

X-ray and microscopic studies, Iowa 151.

Starling, male, sexual inactivity in, relation to light, 603.

Starling, response of sex characters to synthetic hormones, 38.

State fiscal capacity of Maryland and other selected States, Md. 554.

Steel, use in farm-building construction, Iowa 257.

Steers—see also Cattle, beef.

beef, fattening, phosphorus requirements, Idaho 802.

fattening—

alfalfa-molasses silage for, Pa. 803.

effect of thyroidectomy, 382.

factors in linseed meal or oil responsible for finish, Iowa 231.

on milo grain at two levels of feeding, 382.

quality of corn types, Iowa 233.

ration comparisons for, Ariz. 650.

value of shelters and peanut hay, Ala. 515.

feeding corn silage to, Wyo. 93.

Steers-- Continued.

feeding value of distillers' rye dried grains for, Md. 231.

in dry lot, alfalfa-molasses silage v. alfalfa hay for, Ky. 801.

on pasture, concentrates for, La. 801.

sorgo silage, powdered limestone, and protein supplements for, Kans. 92.

stocker, wintering, sorghum silage v. rye pasture for, S.C. 93.

toxicity of lead arsenate and spray residues to, Wash. 527.

Stellio, new species from California, 380.

Stem rust in Texas, U.S.D.A. 768.

Stemphylium—*botryosum*—

on red clover and alfalfa, 209.

resistance of alfalfa to, 771.

pathogenicity and taxonomy of species, Fla. 629.

sarcinaeforme, resistance of red clover to, 771.

Stephanitis pyrioides, insecticides for control, Ala. 469.

Stereum pustulosum, notes, 372.

Sterility in cows, relation to vitamin E. Iowa 238.

Sterilization, chloropicrin, of soil, for effect of previous crop, R.I. 730.

Stichococcus bacillaris, increased stimulation by successive exposures to ultraviolet short wave lengths, 30.

Stilboestrol, regressive changes in reproductive system of male rats induced by, 606.

Stinkbug—

green, on peaches, control, Calif. 83.

southern green, control, Ala. 499.

Stocks, *Rhizoctonia* foot rot of, control, 216.

Stomach, human, emptying time after ingestion of bile preparation, 271.

Stomach worm(s)—

anthelmintic efficiency of phenothiazine against, 106, 109.

in calves with tropical diarrhea, P.R. 821.

in sheep, test of phenothiazine against, 401.

in sheep, treatment, Va. 669.

infective larvae, physiological aging, 818
treatment with repeated doses of phenothiazine, 586.

Stomatal condition, determination by celloidin impressions, 460.

Stomoxys calcitrans, see Stablefly.

Storage(s)—

farm, refrigerator cars as, Mich. 545.

farm, temperatures of wheat in, U.S.D.A. 546.

plants, locker, Wash. 542.

spaces and closets, U.S.D.A. 143.

Stores, national chain and independent, relative prices, Iowa 284.

Strawberry(ies)—

adaptability tests, Hawaii 190.

aphid, notes, 641.

ascorbic acid in, 424.

Strawberry(ies) Continued.

blossoms, protection from spring freezes, La. 761.

breeding, La. 761, Me. 620, Tenn. 477, Wash. 477, West.Wash. 478.

breeding for black root resistance, Tenn. 487.

crown borer, control by methyl bromide fumigation, 224.

crown borer control, poison bait and fumigation for, Ky. 786.

culture, Kans. 48.

culture and fertilization, La. 761.

culture and varieties, Wis. 478.

culture in East, U.S.D.A. 195.

diseases, estimated reduction in yield from, U.S.D.A. 769.

freezing, varieties for, N.Y.State 847.

fruitworm oviposition, 502.

growth, effect of sand-arsenical mixture used for control of white grubs, 791.

leaf disease spray tests, La. 769.

leaf roller, new, notes, 502.

leaf roller, studies, Kans. 84.

nematode crimp disease, Fla. 629.

new variety and breeding methods, 765.

on Muscatine Island, studies, Iowa 190.

pests, troublesome, 643.

pickers, number, source, color, and sex, La. 629.

plant food requirements, Del. 47.

precooling, La. 196.

purple leaf spot, 77.

red stele—

disease, breeding for resistance, 368.

disease in Virginia, U.S.D.A. 628.

disease resistance, Del. 65.

root rot, 636.

root disease, Md. 205.

root rot, relation to decomposition of cover crops, 636.

root weevil, studies, Wash. 503, West. Wash. 503.

runners, dipping before planting, 376.

running-out diseases, Wash. 488, West. Wash. 488.

spacing experiments, Mich. 622.

varieties, adaptation to southeastern Iowa, Iowa 190.

varieties, new, plant and fruit characteristics, U.S.D.A. 56.

variety tests, Colo. 483, Ky. 761, La. 761, Ohio 482.

weevil, studies, Del. 84.

winter injury, protection from, Colo. 483.

Stream(s)—

combination suspended-load sampler and velocity meter for, U.S.D.A. 543.

flow, summer, in Humboldt River, Nev. 542.

forecasts, accuracy, 159.

measurement stations, maximum discharges at, 115.

- Streptococcus—agalactiae—*
 action of gramicidin on, 250.
 effect of colloidal silver oxide on, 534.
 effect on standard plate count of milk, 520.
 infected quarters of udder, treatment with acriflavine, 665.
 on hands of milkers and others, 811.
 udder infection, effect of novoxil liquid, 534.
dyagalactiae, mastitis associated with, 108.
equi, specificity, 529.
 extracts, stimulation of *Lactobacilli* growth by, 394.
β-hemolytic Lancefield group C in bovine mastitis, 400.
paracitrovorus, dissimilation of citric acid by, 461, 659.
salivarius on drinking glasses, presumptive test for, 269.
salivarius, production of large amounts of polysaccharide by, 398.
 test as index of sanitary quality of drinking utensils, Mass. 724.
- Streptococci—*
 fecal, Mass. 724.
 hemolytic, type differentiation in various diseases of equines, 529.
 lactic acid fermentation of, 33.
 long-chained, in Breed smears of market milk, significance, 668.
 of group B, substrates dehydrogenated by, 33.
 of group B, variability in, 33.
 relation to endocarditis in swine, 110.
- Streptococcal cell*, structural differentiation within, 326.
- Streptococcal infections*, effect of sulfonamide drugs in, 106.
- Strigoderma arboricola*, susceptibility to infection by type A milky disease, 512.
- Strigodermella pygmaea*, susceptibility to infection by type A milky disease, 512.
- Strongyle eggs in horses and mules, phenothiazine as anthelmintic, 112.
- Strongyloides—*
papillosus in calves suffering from tropical diarrhea, P.R. 821.
ratti ondatrae, new in muskrat, 374.
- Strongylosis, equine, control in foals, effect of pasture management, 825.
- Strongylus* spp., effect of phenothiazine on, 403.
- Strongylus* spp., intestines, zinc and other metals in, 248.
- Strontium, radioactive—
 biological studies, 416.
 metabolism in pregnant mice, 416.
- Strychnos* spp., wood structure, 325.
- Students, home economics, dietary habits before and after nutrition study, Tenn. 555.
- Stuttgart disease of dogs, etiology and value of *Leptospira* serum, 528.
- Stylocryptus subclavatus*, parasite of hemlock sawfly, 230.
- Subsoil, cause of unproductiveness, Colo. 14.
- Subspecies and variety, use of terms, 170.
- Subulura strongylina* in sharp-tailed grouse, 406.
- Sudan grass—
 breeding, Hawaii 182.
 composition, seasonal variations in, Ariz. 655.
 evaluation for sound pasture program, Wis. 522.
 full-grown frosted, nontoxic effect, Wis. 522.
 nonpoison, development of improved strains, Wis. 471.
 pasture, value, N.Mex. 239.
 pasture with feeds for beef production, Tex. 335.
 pastures, yields and grazing days from, Wis. 522.
 pasturing with lambs and pigs, Wyo. 93.
 smut and bacterial blight of sorghum on, Ariz. 629.
 value for silage, R.I. 810.
- Sugar beet(s)—see also Beet(s).
 breeding, N.Mex. 183.
 culture experiments, Ariz. 181, Wyo. 43.
 culture on nematode-infested soil, Wyo. 43.
 culture under irrigation in northern Great Plains, U.S.D.A. 342.
 curly top, control, 73.
 curly-top resistant varieties, 73.
 disease-resistant strains, breeding and selection, Iowa 205.
 diseases, Wash. 487.
 diseases, estimated reduction in yield from, U.S.D.A. 769.
 effect of boron, Wis. 488.
 fertilizer tests, N.Mex. 183, 753, Wash. 471, Wis. 472, Wyo. 43.
 germinating seed, toxic effect of water-soluble substances in seed ball, 188.
 heart rot, relation to soil conditions, 167.
 industry, migrant laborers in, Mich. 120.
 irrigation methods, Wash. 471.
 leafhopper, see Beet leafhopper.
 machinery, Calif. 115.
 manure and fertilizer tests, Wash. 593.
 production, labor income of, Wyo. 118.
 root rot, N.Mex. 205.
 root rot due to *Alternaria tenuis*, 211.
 rotation and fertilizer experiments, Calif. 40.
 rotation, effect on farm income and expenses, Idaho 829.
 seed production, Ariz. 608, N.Mex. 183.
 seed treatment, Calif. 65.
 southern rot, fungicides for, Calif. 494.
 sugar production and storage, Iowa 182.
 time and amount of irrigation for, tests, Wash. 471.
 variety tests, N.Mex. 753, Wis. 471.
 variety tests for yield and curly-top resistance, N.Mex. 183.

Sugarcane—

- borer control, artificial multiplication of *Lasophaga diatraeae* for, 798.
- borer, control by *Trichogramma minutum*, U.S.D.A. 229.
- borer parasite, introduction and establishment in Cuba, 510.
- borer, parasite of, 648.
- borer, prevalence and control, Fla. 642.
- breeding, Fla. 608.
- brown stripe, studies, 495.
- diseases, foreign, and of Hawaii, 488.
- effect of colchicine treatment, 459.
- eye spot, effect of season and potassic fertilizer, 363.
- eye spot, studies, 495.
- fall planted, danger from low temperature, Miss. 41.
- fertilizer tests, Fla. 609, Miss. 337.
- germination and production, Hawaii, 182.
- gumming disease organism, hosts of, 776.
- insects and other animals attacking in Cuba, 788.
- juice, composition, effect of fertilizers, U.S.D.A. 450.
- mosaic on variety Co. 281, 364.
- Myriogenospora aciculispora* on, 495.
- red rot, studies, 768.
- rootstock weevil, notes, Kans. 84.
- sirup, valuable in diet as source of iron and copper, Miss. 412.
- smut, control, 364.
- stem canker disease, cause, 363.
- studies, Fla. 609.
- variety tests, Fla. 608, La. 752.
- weevil, New Guinea, varietal resistance to, relation to hardness, 90.
- yields, effect of water-table depth, Fla. 675.

Sugar(s)—see also Lactose.

- antioxidative properties when added to milk, Mass. 810.
- in blood, see Blood sugar.
- in talc dust, effect on rooting of stem cuttings, 318.
- Raman spectra, Iowa 151.
- relative sweetness, effect of concentration, N.Y.State 293.
- taste thresholds and taste preferences of rats for, 419.

Sulfaguanidine, coccidiostatic effect, 672.

Sulfanilamide, mode of action, 399.

Sulfate—

- recovery studies, Tenn. 445.
- resistance of commercial cements, Minn. 675.
- retention in soil, effect of limestone and dolomite, 22.

Sulfonamide(s)—

- drugs, use in certain bacterial infections, 106.
- effect on *Staphylococcus* toxins, 666.

Sulfur—

- as plant nutrient, 22.
- compounds, organic, used as insecticides, U.S.D.A. 502.

Sulfur—Continued.

- dioxide, atmospheric, fluctuations of, 588.
- dioxide toxicity to forms of plant and animal life, 456.
- effect of rates of application and forms on tobacco yield and quality, S.C. 42.
- feeding, effect on chicks and laying pullets, 236.
- fungicides for apple scab control, 635.
- of various compounds, retention by soils, 167.
- spraying and dusting materials, Del. 65.
- Sun and weather, variation of, 12.
- Sunflower(s)—
 - chromosome morphology in, 463.
 - for seed, fertilizer and planting tests, Mass. 752.
 - metabolism, effect of sulfur deficiency, 321.
 - morphological characters and flowering processes in, 31.
 - production and ensiling test, Mass. 752.
 - sound and attacked by broomrape, mineral nutrition, 73.
 - tests, N.Mex. 183.
- Sunlight—see also Light.
 - exposure of cows to, effect on vitamin D in milk, Ariz. 694.
- Sunspot cycle and temperature departures at Indianapolis, 728.
- Sunspots, relation to world weather, 586.
- Superphosphate in limed soils, fate of, Tenn. 593.
- Surfaces, flat, bacteriological examination, 174.
- Surplus Commodities Corporation, Federal, report, U.S.D.A. 687.
- Swamp fever, see Anemia, equine infectious.
- Swede(s)—
 - clubroot, control by breeding, 496.
 - fertilizer tests, R.I. 753.
 - stored, vitamin C in, 705.
- Sweet corn—
 - bacterial wilt, forecasts and performance, U.S.D.A. 204.
 - breeding, Fla. 608, Iowa 192, Mass. 762.
 - breeding, spacing, varieties, and fertilizers, Ma. 620.
 - diseases, estimated reduction in yield from, U.S.D.A. 769.
 - fertilizer requirements, Hawaii 190.
 - fertilizers for, West.Wash. 478.
 - freezing adaptability, pericarp toughness as factor, West.Wash. 556.
 - freezing preservation, varietal suitability, U.S.D.A. 50.
 - husked, marketing, Mich. 685.
- hybrid(s)—
 - and open-pollinated, comparison, Tenn. 477.
 - and varieties, tests, Tenn. 477.
 - new for Tennessee, Tenn. 479.
 - new, maturity studies, 346.
 - tests, Mass. 762, Miss. 346.
- improvement, Hawaii 190.

Sweet corn—Continued.

- pericarp, characteristics, relation to toughness, Iowa 151.
- seed production and breeding, Md. 190.
- variety tests, Iowa 190, S.C. 43, Tenn. 479.

Sweet pea(s)—

- artificial lighting, Wash. 542.
- root rot control in greenhouse, R.I. 770.
- vegetative growth and flowering, effect of mineral-nutrient deficiencies and excesses, [N. Y.] Cornell 61.

Sweetclover—

- breeding, Iowa 182, Wash. 471.
- culture and uses, Ind. 758.
- culture experiments, Kans. 40, Wyo. 43.
- disease, effect of vitamin K, 106.
- effects of a nurse crop on, Kans. 41.
- fertilizer tests, Wyo. 43.
- for soil improvement, Okla. 616.
- hay varieties, digestibility of nutrients in, 232.
- in rotation with wheat, kafir, and oats. handling, Kans. 41.
- new mutant leaf character in, 602.
- pasturing with lambs and pigs, Wyo. 93.
- production, spacing and fertilization, Okla. 615.
- resistance to fungus parasites, 771.
- root rot, cause, 634.
- seed yields, effect of late spring clipping Iowa 182.
- strains low in coumarin, root rot-resistant, and late maturing, Wis. 471.
- variety tests, Iowa 182, Kans. 40, Wash. 471.
- volunteer plants, N.Dak. 758.

Sweetpotato(es)—

- adaptability, effect of mineral deficiencies, Fla. 619.
- boron in, Ky. 852.
- breeding, Iowa 182, Tenn. 470.
- culture experiments, Miss. 337.
- curing and storage, Md. 168.
- curing and storing, use of electricity in, S.Dak. 42.
- dips, premarket, effect on soft rot, shrinkage and appearance, N.J. 776.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases, studies, Kans. 65.
- farms v. general, factors for success on, Miss. 550.
- fertilizer tests, La. 752.
- harvesting small amounts during period of root production, effect on total yield, Ala. 470.
- hotbeds, heating methods and insulating materials for, Ariz. 181.
- Maryland, production and marketing, Md. 263.
- mottle necrosis, studies, 211.
- Nancy Hall, vitamin A value at harvest and after storage, Tenn. 555.
- nitrogen carriers, tests, Del. 40.
- nutrient absorption, effect of fertilizer placement, Del. 40.

Sweetpotato(es)—Continued.

- plant production, electricity in, S.C. 42.
- Porto Rico, yield and shape, effect of height of ridge, S.C. 42.
- production and marketing, Md. 551.
- production, effects of grazing by cattle, La. 752.
- seed stock, disease-free, propagation, Iowa 205.
- soft rot, symptoms and control, 776.
- spacing, Miss. 342, 470.
- storage, electricity as source of heat, S.Dak. 42, Tenn. 471.
- storage quality, fertilizer, spacing, and propagation tests, Iowa 182.
- storage tests, Calif. 40.
- varieties, Miss. 336.
- variety tests, Iowa, 182, La. 752, Miss. 337, 470, Tenn. 470, Wash. 471.
- weevils, forms, immature stages of genitalia, 227.
- wilt, control, Del. 65.
- Swimming-pool water pollution, test for, Mass. 724.
- Swine—see also Pig(s) and Sows.
- diseases, protective immunization in, 664.
- economical production, transmission of factors related to, Ala. 464.
- erysipelas, Idaho 815.
- erysipelas, diagnosis, agglutination test for, 111.
- erysipelas, distribution, importance, and control, 664.
- erysipelas in turkeys, 541.
- erysipelas prophylaxis, 664.
- influenza, 402.
- influenza and influenza A viruses, 398.
- influenza virus, lungworm as reservoir and intermediate host for, 823.
- lameness in, relation to diet, 517.
- lymph glands, corynebacterial infections, 536.
- Sycamore *Ceratostomella* disease, Mass. 769.
- Sylvatic plague, fleas as carriers, Calif. 104.
- Symphylla ovicaps* n.sp., description, 644.
- Symphylla sierrae* n.sp., description, 644.
- Sympiesis* sp., biology and immature stages, U.S.D.A. 230.
- Syrphid flies reared from cactus, Kans. 84.
- Symena blanda*, see Flea beetle, pale-striped.
- Tabanus rubidus*, transmission of anthrax by, 537.
- Taber, L. J., biographical sketch, 121.
- Taeniothrips inconsequens*, see Pear thrips.
- Taeniothrips simplex*, see Gladiolus thrips.
- Tamerlana bragal*, parasite of pigeon in Puerto Rico, 82.
- Tangelos, breeding, Calif. 52, N.Dak. 52.
- Tankage—
- as protein supplement for fattening pigs, S.C. 92.
- productive energy in fowls, Tex. 388.
- Tapeworm(s)—
- cysts, evagination, use of bile salts for, 500.
- in poultry, Kans. 104.

Tapeworm(s)—Continued.

- in poultry, tin preparations for treatment, 114.
- larval, artificial evagination, 499.
- removal from chickens, tests with tetra-alkyl tin compounds, 674.
- resistance to, in poultry and man, Kans. 104.

Taphrina—

- caerulescens*, morphological differences on oak species, 372.
- deformans*, morphology and cytology, 372.
- errata in recent papers on, 372.
- genus, bibliography and list of valid species, 372.
- app., leaf curl, notes, 78.

Tarnished plant bug—

- on cotton, insecticides against, 504.
- studies, Kans. 84.

Taro—

- as a food, 123.
- calcium and phosphorus, use by rats, 123.
- calcium and phosphorus, use by women, 123.
- starch determination in, Hawaii 182.

Tartar emetic, recommendations for use, 376.

Tarweed, toxicity tests for fattening lambs, 823.

Tax(es)—

- and local government services, Iowa 262.
- assessments, inequality of, Iowa 262.
- committee, joint, of grange and farm bureau, Md. 263.
- delinquency, relation to local government organization and finance, N.Dak. 263.
- rural property, and State aids, Wis. 680.

Taxonomic journal, financing, 451.

Taxonomy—

- and floristics of tropical and South Africa, 452.
- significance of bacterial spore antigens in, 595.

Tea leaf respiration and anaerobic fermentation, 322.

Tea, tetraploidy in, 464.

Teat sphincter, anatomy and physiology, 519.

Teeth—

- carious lesions in, method for staining, 697.
- decay, effect of fluorine ingestion, 129.
- decay, use of fluorides for retardation, 129, 130.
- first, age of cutting, relation to vitamin D intake, 573.
- fluorine-containing dentin and enamel of, solubility, 419.
- manner of acquisition of fluorine by, 697.
- mottled, durability of, 130.
- mottled enamel, caries and fluorine, 419.

Tegillum fimbriatum n.g. and n.sp., description, 68.

Temperature(s)—see also Climate and Soil temperatures.

- and rainfall statistics, relation to rice and other crops, La. 729.
- controls, another circuit for in laboratory work, 451.

Temperature(s)—Continued.

- maximum, prediction and insolation, 585.
- soil and air, value of mean and average, 308.
- variations, effect of tropospheric and stratospheric advection on, 12.

Tenebrioides mauritanicus, see Cadelle.

Tennessee Station, report, Tenn. 575.

Tenuipalpus—

- micelli* n.sp., notes, 85.
- quadrisetosus* n.sp., notes, 85.

Teosinte—

- chromosomes, knob positions on, 601.
- vegetative growing points, studies, 43.

Tephrosia virginiana resin, noncrystalline portion, toxicity to housefly, 226.

Termite(s)—

- control, 644.
- eastern subterranean, tube-building habits, 790.
- of Puerto Rico, summary, 220.

Terrace—

- construction with small equipment, U.S.D.A. 258.
- maintenance, plowing for, U.S.D.A. 258.

Terracing, value in soil conservation, 448,

Wis. 446.

Terrapene ornata parasitism by *Sarcophaga cistudinis*, 83.

Terrapin scale control, 86.

Testes—

- in rats treated with testosterone propionate, inhibition and stimulation, 332.
- of immature pigeons, response to gonadotropins, 605.
- pronounced stimulation by pregnancy urine in birds, 603.

Testosterone injections in caponized fowl, effectiveness, relation to vitamin E, 604.

Testosterone propionate—

- administered at different seasons, effect on body growth, 180.
- effect on rat testis, 332.
- effect on somatic growth in rat, 749.
- growth stimulating effect of small doses in castrated rats, 331.
- in immature female rats, effects, 179.
- large doses, growth depressing effect in castrate rat, 463.
- methyl testosterone, and testosterone in pellet form, comparative androgenic potency, 331.
- pellets, absorption and effects, 331, 333.

Tetrameres americana in eastern cardinal, 640.

Tetranych

- atlanticus* n.sp., description, 92.
- talaris*, see Red spider.

Tetraploidy in tea, 464.

Tetrastichus xanthops, biology and immature stages, U.S.D.A. 230.

Texas College, notes, 865.

Textile(s)—see also Fabrics.

- fabrics, service qualities, factors affecting, Kans. 142.

Textile(s)—Continued.

fiber(s)—

and materials, 281.

at elevated temperatures, moisture relations, 429.

atlas, descriptions and photomicrographs, 141.

refractive indices, determination, 282.

guide to, 141.

Thallium toxicity of tobacco, relation to boron, 74.

Theelin extraction, historical account, 607.

Thermobia domestica, see Firebrat.Thiamin—see also Vitamin B₁.

and diabetes, 566.

and metabolic products in urine, determination, 727.

application of sulfite cleavage to yeast fermentation method, 727.

chemical determination, modified Melnick-Field method, 727.

chloride in peanuts and products, Ga. 728.

deficiency—

and deficiencies of other members of the vitamin B complex, difference between, 422.

and fright disease, 671.

role in occidental beriberi with cardiovascular manifestations, 567.

failure to improve growth of excised tomato roots, 318.

hydrochloride, physiological activity and clinical use, 700.

in dried pork muscle, 860.

in green plants, 172.

in rumen content of livestock fed vitamin-low diets, 384.

in tomato, production and transport, 170.

relation to citric acid metabolism, 274.

Thiobacillus—*coprothicus* n.sp., description, 19.*thiooxidans*, effect of surface on formation of sulfate by, 32.*thiooxidans*, sulfur oxidation by, necessity for direct contact in, 734.

Thiocyanogen value of linolenic acid, 294.

Thrips tabaci, see Onion thrips.

Thromboplastin, stable, for Quick's prothrombin test, 10.

Thymectomy in six successive generations of rats, effect on growth and development, 335.

Thymus—

gland, relation to sex hormones and reproductive processes in rat, 608.

involution during pregnancy in young mice, 39.

wt. changes in following various experiments, 604.

Thyroid—

and parathyroid deficiency, congenital, treatment, 711.

gland, dependence of seasonal periodicity in gonadal changes, 335.

Thyroid—Continued.

gland of dog, parafollicular cells in, hereditary variations, 747.

relation to mammary gland growth in rat, 469.

Thyroidectomy—

effect on reaction time to an electric shock, 38.

effect on sexual behavior in a bull, 39.

in fowls, effects, 335.

partial, effect on fattening of steers, 382.

Thyronectria, monographic study of genus, 23.

Thyroxine injections, effect on reaction time to an electric shock, 38.

Thysanota custator on corn, Kans. 84.*Tibraca stimulima* n.sp., injurious to rice in Ecuador, 644.

Tick(s)—

bites and biology of ticks, 800.

borne diseases and Rocky Mountain wood tick, 666.

control, Calif. 83.

in Delaware, studies, Del. 84.

of East Africa, 800.

on cattle and horses, derris root infusion for, 399.

other than fowl ticks, transmission experiments, 826.

tropical cattle and others, biology and effect of arsenical dips, P.R. 799.

Tillage—

contour and terracing around large playa lakes, 337.

contour v. slope, effect on run-off, 733.

tools, tests, 544.

Tilletia euphorbiae n.sp., notes, 372.*Tilletia horrida* on rice, 66.

Timber—see also Lumber and Wood.

and snow studies, Nev. 444.

commercial, of United States, 203.

fire-killed coniferous, longhorned and flatheaded borers on, 792.

fungal decay in, relation to death-watch beetle, 645.

lands, financing fire protection for, Oreg. 487.

management in Southwest, 625.

of old South Meeting House in Boston, beetle control problem, 792.

species, native, reproduction, Calif. 62.

trees, volume growth and yield, Iowa 201.

Timothy—

alfalfa mixtures, seeding, use of grass seeding attachments on corrugated land rollers, Wis. 471.

hay, fertilizer tests, [N.Y.] Cornell 609.

proliferation in, R.I. 753.

strain tests, Mass. 752.

value for silage, R.I., 810.

variety tests, Ky. 751.

vegetative growing points, studies, 43.

Tin in biological material, 698.

Tingitidae, new American, 644.

Tires, pneumatic, on agricultural equipment, efficiency and economy, Iowa. 287.

Tissue(s)—

autolysis, principle and application in canine therapy, 113.

hard, histological sectioning by new technic, 460.

human, trace metals in, 608.

Tritospora andropogonis, notes, U.S.D.A. 64.

Trialeurodes, notes, 643, Mass. 786.

Toad(s)—

giant, vector of helminth ova in Puerto Rico, 82.

of Iowa, distribution, 217.

Tobacco—

affected with curly top and mosaic, phloem anatomy of, Calif. 364.

affected with mosaic, inclusions in guard cells, Calif. 364.

analyses, Tenn. 437.

black root rot, Mass. 760.

black, studies, Conn.[New Haven] 760.

breeding, Tenn. 470.

bright belt, development of roots, relation to soil moisture, 169.

bright, nutrient absorption by, time and rate, 343.

bright, yield and quality, relation to soil, Fla. 589.

Burley and dark, curling experiments, Ky. 751.

Burley, boron in, Ky. 852.

bushy stunt virus, ultracentrifugation studies, 212.

cigar-leaf, research, Conn.[New Haven] 759.

diseases, control, Conn.[New Haven] 776.

diseases, estimated reduction in yield from, U.S.D.A. 769.

diseases, field and plant-bed, Fla. 629.

diseases in Puerto Rico, U.S.D.A. 357.

diseases, papers on, 73.

diseases, studies, Ky. 769, S.C. 65.

doubling of chromosomes induced by colchicine, 462.

downy mildew—

control, 495, Conn.[New Haven] 776, Md. 205, U.S.D.A. 204.

copper-soap spray for control, 74.

gas treatment for, U.S.D.A. 74.

in Argentina, 74.

in Virginia, U.S.D.A. 628.

effect of preceding crop, Mass. 752.

farm practices with, N.C. 42.

fertilizer experiments, Ky. 751, Tenn. 471.

flea beetle—

hibernation and parasitism, 792.

in abandoned plant beds, 792.

studies, S.C. 84, Tenn. 502.

flue-cured, studies, Fla. 609, Va. 616.

frost damage in August, Conn.[New Haven] 729.

Fusarium wilt, Md. 205.

Granville wilt and black shank, control program, 634.

growing in sand with culture solution, Conn.[New Haven] 292.

hornworm, notes, Tenn. 502.

Tobacco—Continued.

insects, field survey for, Conn.[New Haven] 786.

insects, recommendations for control, U.S.D.A. 86.

leaf, fresh, nicotine in, determination, 298.

mosaic control, 212.

mosaic-resistant, virus distribution, relation to pattern development in susceptible varieties, 405.

mosaic-susceptible, virus distribution in leaves, 495.

mosaic virus—

acetyl and phenylureido derivatives of, 776.

biological activity and age of lesion, correlation, 777.

Brazilian beans as indicators for, 213.

effect of alkali and simple organic substances, 68.

inactivation by urea, 68.

inhibition of increase and activity by N deficiency, 405.

nucleoprotein, pure, preparation, 212.

overwintering in soil, Mass. 769.

physiology, Md. 205.

protein, sulfur distribution in, 74.

rate of movement in plant, Wis. 488.

reactions of, 364.

strain on pepper, 213.

ultracentrifugation studies, 212.

moth in warehouses and factories in Great Britain, 643.

necrosis virus, inactivation by urea, 68.

nutrient deficiency in, 356.

plant-bed fertilization, Fla. 609, S.C. 42.

planting date, effect, 74.

plants, concentration of alfalfa mosaic virus in, 213.

plants, fumigation, Fla. 619.

powdery mildew, control, 73.

production, trends in, Ky. 829.

protein and mosaic-virus protein as anaphylactogens and precipitinogens in guinea pig, 630.

recovery of constituents other than nicotine from, Ky. 725.

research, Ky. 751.

ring spot, recovered, experimental production of symptoms in, 496.

root knot control, Fla. 629.

rotations and air-curing tests, Tenn. 471.

seed and seedbed disinfection, 73.

seedbeds, injury by cyanamide for weed control, Wis. 472.

seedbeds, soil treatments for, Mass. 769.

slime disease problem in Sumatra wrap per district, 212.

thallium toxicity, relation to boron, 74.

thrips and potato flea beetle, simultaneous control, Conn.[New Haven] 786.

variety tests, N.Mex. 753, Tenn. 470.

wildfire and blackfire, control, 364.

Tobacco—Continued.

- wildfire, plant-bed sprays for control, Wis. 488.
- worm, life history and biology, 785.
- yellow mosaic of tomato, 214.
- yield and quality, effect of rates of application and forms of fertilizers, S.C. 42.
- Tocopherol, α —see also Vitamin E.
- another homolog of, 443.
- growth stimulating activity, 426.
- minimum prophylactic dose to insure normal cross-striated musculature in suckling rats, 426.
- minimum requirement of rabbits, 278.
- physiological activity and experimental clinical use, 712.
- prevention of nutritional myopathy of ducklings by, 255.
- revision of annotated bibliography, 712.
- treatment for neuritis, 138.

Toluenesulfonyl chloride derivatives, toxicity and repellent action to greenhouse leaf tier, 507.

Tomato(es)—

- arsenic toxicity to, Hawaii 205.
- ascorbic acid in, 424.
- big bud, host range and distribution, 214.
- Bounty, description, N.Dak. 53.
- breeding, Mass. 762. Me. 620, Miss. 344. Tenn. 477, West.Wash. 478.
- buckeye rot in California, 777.
- bug, ecology, Hawaii 218.
- bushy stunt virus, effect of alkali and simple organic substances, 68.
- bushy stunt virus, inactivation by urea, 68.
- canned, vitamin C in, 705.
- canning factory, economic analysis of production, Ind. 834.
- carotene in, effect of habitat and fertilization, 699.
- composition, in British Columbia, effect of climate, 763.
- cost of production, Ia. 264.
- culture, Tenn. 477.
- curly-top disease, double-bill planting for control, Utah 214.
- direct seeding for production and disease control, 75.
- diseases, control, Fla. 629, R.I. 770.
- diseases, dusting v. spraying for, Wis. 488.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- diseases in New Jersey, U.S.D.A. 204.
- early blight, control, Miss. 430.
- effect of mulching, Mass. 762.
- Essar, development, Calif. 49.
- fertilizer study, partial elimination of experimental error by significance tests, 48.
- fertilizer tests, Ia. 762.
- foliage diseases, control, Fla. 629.
- fruit, phosphorus absorption at various stages, 321.
- fruit size and shape inheritance, Iowa 190.

Tomato(es)—Continued.

- fruitworm control, Ky. 736.
- fruitworm studies, 796, S.C. 84, Tenn. 226, Wash. 503.
- fungicide, yellow copper oxide v. bordeaux, Ky. 769.
- Fusarium* wilt, epinasty as early symptom, 74.
- Fusarium* wilt, notes, Tenn. 487.
- Fusarium* wilt-resistant, Mich. 65.
- genes and carotenoids, relation, 602.
- gray spot, outbreak in Florida, U.S.D.A. 64.
- greenhouse, *Botrytis* stem rot of, U.S.D.A. 204.
- greenhouse, foliar diagnosis study, 348.
- greenhouse, nutrition, foliar diagnosis of disease, Pa. 742.
- greenhouse, organic matter for, Mass. 762.
- growing for profit, N.J. 480.
- grown in culture solutions, fruit abnormalities, 349.
- growth and fruiting, effect of environment, Md. 191.
- growth and yield, relation to soil pore space, 193.
- growth in nutrient solution, effect of aeration, 620.
- harvesting and packing, Mass. 830.
- hybrids, interspecific, resistant to *Fusarium* wilt, development, U.S.D.A. 74.
- improvement by selection of new hybrids, Fla. 619.
- in sand culture, growth and yield, effect of vitamin B₁ and nicotinic acid, 599.
- juices, home-canned, of Colorado, 411.
- leaf mold, resistance of Bay State variety to, Mass. 769.
- leaf spot, spraying and dusting for, Tenn. 487.
- manganese deficiency, effect on histology, 777.
- meristem size, relation to organ size, 349.
- new genetic characters, 602.
- on sandy soils, nitrogenous fertilizers for, Fla. 589.
- plants—
- absorption of N from sodium nitrate application, Ky. 761.
- analyses as guide to fertilization, Ky. 761.
- direct-seeded v. southern and home-grown, Iowa 190.
- induced formation of β -gentiobiosides in, 169, 599.
- residual effects of forcing and hardening, U.S.D.A. 49.
- shipping, use of glycerin in, 349.
- starting, nutrient solutions for, R.I. 762.
- potato ring rot bacteria infecting, Wis. 488.
- problem, answer to, N.J. 763.
- pruning and training, Miss. 344.
- pylild, studies, U.S.D.A. 502.

Tomato(es)—Continued.

- resistance to root knot nematode, seedling test method for, 782.
- response to fertilizers, rapid soil tests in relation to, Fla. 589.
- roots, excised, failure of certain substances to improve growth, 318.
- spotted-wilt-resistant, breeding, Calif. 49
- spraying and dusting, Md. 191.
- stems, histological responses to β -naphthoxyacetic acid, 319.
- tobacco streak on, Ky. 769.
- tobacco yellow mosaic on, 214.
- transpiration and growth, factors affecting, 193.
- transplanting methods, Tenn. 477.
- varieties, La. 761, Miss. 348.
- varieties for home garden, Wis. 478.
- varieties, new, Calif. 192.
- varieties, vitamin C in, comparison, 708.
- variety tests, Iowa 190, Ky. 761, La. 762, Miss. 344, N.Mex. 191.
- viruses pathogenic to, 777.
- vitamin C in, 571.
- western, studies, 558.
- western yellow blight, varietal resistance, N.Mex. 191.
- wilt, control, Fla. 629.
- wilt, effect of root knot nematode on, 778.
- yellows, studies, Ariz. 628.
- yields, effect of time of planting, Me. 620.
- yields, increasing, N.Y.State 193.

Tortrix pallorana, notes, 502.*Toumeyella nuntiatum*, sprays for control, Mich. 222.

Towns, small, life in, 121.

Toxoplasmosis, avian, with invasion of erythrocytes, 826.

Toxoptera graminum, see Green bug.

Tractor, new four-wheel, tests, Mich. 115.

Tractor tests, Nebr. 260.

Trade—

- agreements and agricultural foreign trade, U.S.D.A. 679.
- barriers between States, work on, Calif. 117.
- foreign agricultural, of United States, new quantity indexes, U.S.D.A. 840.
- Transeema pedella*, biology and immature stages, U.S.D.A. 280.

Transparencies for insect and plant materials, 502.

Transpiration—

- and evaporation, committee on, 302.
- effect of osmotic concentration and cell permeability, 743.
- effect of wind, factors affecting, 159.
- of apple leaves, effect of leafhopper injury, 778.
- of single leaves, method for continuous measurement, 596.
- of tropical fruits during ripening, 597.
- rate of whole *Coffea* trees, 596.
- Transportation, family expenditures for, U.S.D.A. 284.

Trappers of Michigan, occupations and income, Mich. 783.

Tree(s)—

- blister rust infected, of ornamental value, surgery for, 373.
- coniferous, see conifers.
- cuttings, evergreens and softwood, rooting, value of growth substances, 201.
- diseases, control, 372.
- diseases, list of specimens received, U.S.D.A. 204.
- effect of drought on, Kans. 48.
- evergreen, see Evergreens.
- for conservation and erosion, hillculture studies, Iowa 257.
- for farm and shelterbelt planting, Wyo. 62.
- forest, introductions, tests, Fla. 619.
- forest, nursery, cultural practices, Iowa 201.
- forest, root development in soil types, 354.
- freak weather damage to, 729.
- growth and reproduction, 201.
- growth, annual ring measurements, varietal differences, 201.
- hardwood—
 - bleeding canker, N.J. 638, R.I. 770.
 - damaged by snow, top rot in, 79.
 - Neotria* canker affecting, 78.
 - seasonal course of height growth in, 766.
- insects, major, 505.
- nursery, production for erosion control, Iowa 201.
- of North Dakota, N.Dak. 485.
- ornamental, care of, Miss. 624.
- ornamental, fertilization, Ohio 765.
- pests, important, of Northeast, 371.
- plantations in Minnesota, rodent damage, 783.
- planting stock, cold storage of, 486.
- response to climate, 302.
- ring analysis, propositions in, 588.
- ring analysis, technic, 460.
- ring study of very old bur oak, 325.
- rings, California precipitation records in, 302.
- seedlings, deficiency symptoms for major elements, 627.
- seedlings, dormancy, effect of day length, 68.
- selectivity as factor in spacing, Ala. 484.
- shade, insect pests, 644.
- shade, pests, new and unusual, 789.
- shade, troubles, diagnosis, 498.
- shade, wound treatment, Miss. 143.
- shelterbelt, see Shelterbelt(s).
- stagheaded pasture, Mich. 627.
- sycamore mite injurious to, 650.
- trunk pressures, internal, attempt to record, 178.
- Trematodes in ruffed grouse, 405.
- Trematodes parasitic on dogs, 528.
- Trembles produced by toxic butter, 401.
- Trench mouth treated with nicotinic acid, 424.

- Trialeurodes* n.sp., studies, Kans. 84.
Tribolium confusum, see Four beetle, confused.
 Trichina in swine, detection, intracutaneous tests, 402.
Trichinella—
 larvae, encysted, penetration of radio-active phosphorus into, 105.
 spiralis, developing larvae, effect of dis-integration products of tissue, 499.
Trichogramma—
 evanescens, effects of different hosts on, 648.
 minutum for control of sugarcane borer in Louisiana, U.S.D.A. 229.
 oviposition on eggs of Angoumois grain moth, 229.
Tricholipneurus virginianus, notes, 648.
Trichomonas—
 columbae, notes, 641.
 fetus and *T. vaginalis* in chick embryos, comparison of growth, 532.
 fetus, orchitis and seminal vesiculitis associated with, 320.
 gallinarum infection in turkeys, type of liver lesions in, 541.
 gallinarum, notes, 255.
Trichomoniasis—
 bovine, diagnosis and treatment, Md. 248.
 in turkeys, treatment by fever therapy, 255.
Trichostrongylus pupivora, parasite of coconut caterpillar, 515.
Trichostrongylus—
 axei, phenothiazine v. copper-nicotine solution for, 669.
 spp. in sheep, Va. 669.
 Triglycerides, synthetic, rate of absorption in rat, 560.
 Trigonelline, synthesis and excretion, 860.
 Trimethylene glycol formation from glycerol by *Aerobacter*, 7.
Trionymus—
 carlots n.sp., description, 506.
 cladestinis n.sp., description, 506.
Triphleps thripoborus n.sp. predaceous on citrus thrips, 85.
Tripterygium wilfordii, introduced into U. S. 87.
Triticum sativum, cytoplasmic inclusions in glandular epithelium of scutellum, 169.
Trineptis klugii, parasite of hemlock sawfly, 230.
Tritons spp., studies, Iowa 218.
 Trout, anemic, hemoglobin regeneration, 374.
 Truck crop(s)—
 farm prices, index numbers, Fla. 677.
 fertilizer requirements, Fla. 619, R.I. 762.
 fertilizers for, Miss. 345.
 insects, Me. 642.
 nutrient deficiency symptoms in, 357.
 organic matter requirements, R.I. 762.
 production, relation to orchard soil toxicity, Wash. 477.
 Truck crop(s)—Continued.
 selection, breeding, and fertilizer requirements, Wash. 477.
 varieties, studies, Wash. 477.
 Truck farms, income and indebtedness, Miss. 410.
Trypanosoma—
 avium in crows, 82.
 equiperdum, infection of chick embryos and chicks with, 666.
 Trypetidae—
 African, descriptions of new species, 85.
 gall-forming, new species of South Africa, 85.
Tryphetus incarnatus, notes, 86.
 Tryptophane—
 content of pituitary lactogenic hormone of cattle and sheep, 607.
 L-, histological reactions of beans to, 320.
 requirements by chicks, 389.
 Tubercle bacilli—
 bovine, isolation, media for, 401.
 from tissues of cattle tested with tuberculosis, demonstration, 664.
 growth, morphological forms found in, 664.
 on chorioallantoic membrane of chick embryo, growth and effects, 817.
 Tuberculin molecule, size and shape, relation to intracutaneous potency, 399.
 Tuberculosis—
 human and avian, experimental production in chorioallantoic membrane of chick embryo, 818.
 pulmonary, urinary excretion of combined ascorbic acid in, 425.
 studies, Calif. 104.
 Tulip—
 anthracnose, symptoms, 371.
 bulb aphids on southern Iris, control, 785.
 diseases, spraying for control, West. Wash. 488.
Tulipa genus, cytogenetics of, Md. 190.
 Tumors in inbred strains of mice, 746.
 Tumors, transplanted spontaneous, in mice, effect of extra chromosomal influence, 330.
 Tung tree(s)—
 branches, girdling, effect of methods, 199.
 crown and root rot, La. 769.
 culture, La. 761.
 developing framework from dormant buds, Miss. 354.
 distribution of root systems, error of sampling in study, 199.
 experiments, Miss. 353.
 fruits, variation in, 199.
 nut production, relation to temperature, 354.
 propagation, planting, and fertilizing, Fla. 619.
 selection for productivity and oil in nuts, Fla. 619.
 Turf damage by a scarabaeid beetle, 379.
 Turf diseases, thiram sulfide for, 491.

Turkey(s)—

- breast area measurements, Ky. 801.
- bred for small size and earliness, uniformity of gains, Nev. 516.
- differences in sexual maturity and egg production, 178.
- duodenum, microanatomy, Calif. 827.
- eggs, hatchability, effect of relative humidity, Ky. 747.
- embryonic development, Wash. 516.
- erysipelas outbreaks in flocks, 664.
- Erysipelothrix rhusiopathiae* infection in, 541.
- gnat, studies, Iowa 218.
- meat, boning, curing, smoking, and cooking, Mich. 655.
- meat, palatability, effect of rations, Wyo. 98.
- meat, quality, effect of cereal grains on, Wyo. 655.
- nutritional requirements, Wash. 516.
- poults from hens fed different levels of vitamin D, growth and calcification, 808, Wash. 516.
- poults, vitamin D requirement, 390.
- production, restricted feed consumption and value of grass pasture, Kans. 92.
- rations and feeding methods, N.J. 237.
- rearing methods, N.J. 808, Ohio 808.
- use of all-night lights for, 808.
- vitamin D requirements of, Wash. 516.

Turnip(s)—

- aphid, control, Ala. 499, Idaho 786, U.S.D.A. 222.
- clubroot, control by breeding, 496.
- greens grown under different conditions, comparative mineral composition, S.C. 48.
- yield, factors affecting, Ala. 477.

Turpentine, gum, exclusive of the pinenes, composition, U.S.D.A. 11.

Tylenchoidea, new genus and species, 217.

Tyloclerma fragariae, see Strawberry crown borer.

Tuphlocyba pomaria, see Apple leafhopper, white.

Typhoid, mouse, interaction of genetic constitutions of host and pathogen, 747.

Typhoidlike diseases in laboratory animals, resistance and susceptibility to, Iowa 247.

Tyrosine content of pituitary lactogenic hormone of cattle and sheep, 607.

Tyrosine metabolites, excretion, effectiveness of ascorbic acid in preventing, 572.

Udder congestion at freshening time, physiology of, Kans. 98.

Udder infection, effect of colloidal silver oxae on, 584.

Ullucus tuberosus seedlings, development, effect of day length and temperature, 328.

Ultraviolet—

- radiation, bactericidal effect, 600.
- rays applied to milk, lethal effectiveness, 520.

Uncia stenocephala from dogs in Chosen, 529.

Undulant fever—

- and Bang's disease, interrelation, Mich. 665.
- diagnosis, 816.

U. S. Department of Agriculture—

- Graduate School, editorial, 721.
- organization directory and field activities, U.S.D.A. 844.
- publications, numerical list, 578, 717.

United States Weather Bureau work, and weather forecasting, 585.

Urea-Ammonia Liquor-37, insoluble nitrogen derived from, value, 736.

Urea as partial substitute for protein in cow rations, Mass. 809.

Urea as protein substitute for helters, Hawaii 238.

Urea, inactivation of some plant viruses by, 68.

Uredinales—

- morphology, 315.
- of New Guinea, new species, 315.

Urine—

- and blood, riboflavin in, 275.
- concentration of acetone bodies in, effect of glucose feeding, 519.
- human, *Brucella* antibody in, Mich. 530.
- human, hitherto unrecognized nicotinic acid derivative in, 702.
- of dairy cattle, acetone bodies in, variations, 519.
- of normal and vitamin E-depleted rats, oestrogen in, 181.
- pantothenic acid in, 442.

Urocystis—

- gladioli*, notes, 370.
- occulia*, notes, 638.
- tritici*, notes, U.S.D.A. 768.

Uromyces—

- phaseoli typica* on bean, differentiation of physiologic races, 773.
- trifolii fallens*, resistance of red clover to, 771.

Urophora solstitialis, notes, 798.

Ustilaginales, British, list, 171.

Ustilago—

- avenae* and *U. perennans*, hybridization between, 858.
- hypodytes, cause of sea lyme-grass disease, 207.
- scitaminea*, notes, 364.
- spp. cultures, variation in, 771.
- seae* chlamydospores, variation in germination, 68.

Utah College, notes, 576.

Utah Station, notes, 576, 719.

Uterus—

- of mouse, effect of progesterone, 38.
- weight, in immature rat, effect of androgens, 87.

Vacatone as source of vitamin G in chick starting rations, West Wash. 518.

Vaccinium spp., botanical and economic distribution in Maine, 622.

- Valonia ventricosa*, cellulose fibril formation in chloroplast, 169.
- Variety and subspecies, use of terms, 170.
- Veal production, relation to number of cattle on farms, Okla. 677.
- Vegetable(s)—
- adapted for freezing preservation, Wis. 478.
 - and fruit market, Knoxville wholesale, supply aspects and facilities, Tenn. 685.
 - and fruit market, St. Louis wholesale, organization and costs, Mo. 835.
 - and milk, comparison of utilization of calcium in, 127.
 - antiscorbutic values, 570.
 - ascorbic acid in, 424.
 - ascorbic acid retention as criterion of nutritive value, 134.
 - breeding for insect resistance, 789.
 - canned, sterilizing, Calif. 5.
 - carbohydrate values, 152.
 - carotene analysis as basis for vitamin A value, 854.
 - carotene in, effect of habitat and fertilization, 699.
 - colloidal clay culture for nutritional experiments, 345.
 - cooking, chemical changes in, Mass. 845.
 - diseases on New York market, U.S.D.A. 768.
 - diseases previously unreported in Idaho, U.S.D.A. 357.
 - diseases, seed- and soil-borne, Fla. 629.
 - diseases, studies, Kans. 65.
 - early forcing, damping-off, control, Mass. 769.
 - effect of green manures, Fla. 619.
 - farms, labor income and factors affecting it, Mass. 830.
 - fertilization, effect on ash, Ca, and P content, 556.
 - fertilizer requirements, rapid soil tests for, Va. Truck 312.
 - freezing preservation, Iowa 190.
 - freezing, procedure and varieties, Colo. 847, N.Y. State 847.
 - fresh, in refrigerated storage, effect of reduced evaporation on vitamin content, 706.
 - fresh leafy, vitamin D in, 425.
 - fresh, trade between United States and Canada, effects of trade agreements, U.S.D.A. 840.
 - frozen, high quality, manufacturing and distributing, precautions in, 155.
 - green, v. bleached, for calcium, iron, and vitamin content, Miss. 556.
 - growth and yield, relation to soil reaction, Fla. 619.
 - harvesting and handling, Ga. 762.
 - heat of respiration, calorimetric measurements, U.S.D.A. 546.
 - improvement by breeding and selection, Mass. 762.
 - industry of State, merchandising practices, Mass. 830.
- Vegetable(s)—Continued.
- insects, control, relative efficiency of rotenone-containing insecticides, Ala. 499.
 - insects, studies, Kans. 84.
 - juices, studies, Calif. 5.
 - leafy, best sources of iron and calcium, Miss. 430.
 - marketing through cooperative canning associations, Oreg. 538.
 - New Mexico, marketing opportunities in Texas, N.Mex. 263.
 - nutrient deficiency symptoms in, 337.
 - of Ceylon, vitamin C in, 570.
 - oils, *see* Oil(s).
 - optimum levels of nitrate nitrogen for, R.I. 730.
 - phosphorus removed by, relation to that in soil, 166.
 - pigmented, ascorbic acid in, 134.
 - preparation and freezing in lockers, 124.
 - prices and receipts, on Terre Haute producers market, Ind. 836.
 - production, value of organic matter in, Md. 191.
 - proteins, *see* Protein(s).
 - quick-frozen, vitamin C in, effect of cooking methods, 571.
 - raw and cooked, composition and energy value, 691.
 - Rhizoctonia* diseases, control, Fla. 629.
 - root knot control, Fla. 629.
 - seed treatment tests, R.I. 770, U.S.D.A. 360.
 - seeds, production, N.Mex. 101.
 - soils, fumigation, R.I. 762.
 - storage and preservation, Fla. 619.
 - suitability for sharp freezing, N.Dak. 847.
 - trace-element requirements and deficiency symptoms, Fla. 589.
 - use of cloth houses for, Kans. 48.
 - use of liquid fertilizers for, 592.
 - used by Filipinos in Hawaii, vitamin assays, Hawaii 268.
 - vapor heat treatment, Hawaii 190.
 - varieties adapted to Wisconsin marsh soils, Wis. 478.
 - varieties best for Utah conditions, Utah 192.
 - varieties, new, for California, Calif. 191.
 - variety tests, Fla. 619, Hawaii 190, Kans. 48, Mass. 762, Me. 49, Miss. 344, R.I. 762, West. Wash. 478.
- Vegetation—*see also* Flora(s) and Plant(s).
- mechanics of movement of, 170.
 - pasture and woodland, effects of burning, Okla. 473.
- Velvetbean caterpillar, control, Ala. 499.
- Vernalization—*see also* specific crops.
- effect on chlorophyll in wheat seedlings, 173.
- Veronica, polyploidy and geographic distribution of species, 171.
- Verticillium*—
- alb-atrum*, notes, 372.
 - dahliae* spores, distribution by sap stream in elm, 781.

Verticillium—Continued.

- sp. on elm, Mass. 769.
- wilt of elm, 78.
- wilt of peppermint and *Viburnum*, U.S.D.A. 357.
- wilt, varietal reaction of eggplant to, R.I. 770.

Vesiculitis, seminal, in bull, 820.

Vetch(es)—

- diseases, seed-borne, 491.
- for cover crop, La. 752.
- hairy, fertilizer tests, La. 752.
- hairy, inoculation studies, La. 752.
- liming test, La. 752.
- resistance to aphid injury, varietal differences, Ala. 499.
- yield, effect of continuous and intermittent cropping, Ala. 470.

Veterinary—*see also* Animal diseases.

- history, American, 815.
- obstetrics, 397.

Vibrios, chemistry and serology, 248.

Viburnum wilt in Indiana, U.S.D.A. 357.

Villages, unincorporated, analysis of data sources, 841.

Vincent's disease treated with nicotinic acid, 424.

Vine weevil, black, ethylene dichloride for, Ky. 786.

Vines, chlorine gas injury, 208.

Vinyon, descriptions and photomicrographs, 141.

Viola, allopolyploids in, contrasting progeny, 176.

Viola species, grafting, 176.

Viola(s)—

- male gametophytes in, 176.
- of Alachua Co., Florida, and soils, 170.
- of Alachua Co., Florida, key, 315.
- species, soil relations, 740.

Vitosterol treatment of rickets with minimal dosage, 137.

Virginia Station, notes, 720.

Virus(es)—

- activity, problem, physicochemical viewpoints, 68.
- behavior in plant roots, 630.
- behavior in tubers, seeds, and fruits, 358.
- borderland of life, 490.
- effect of X-ray irradiation, Iowa 205.
- egg propagated avian, method and practical application, 664.
- filtrable, studies, 540.
- nature of, 207.
- structure, 490.

Vitamin A—

- and carotene, feeding, effect on milk, 394.
- and vaginal response to sex hormones in rat, 606.
- assay with photoelectric colorimeter, 7.
- concentration in body tissues, effect of nutritional intake, 565.
- containing oils, local application to eye, 699.

Vitamin A—Continued.

deficiency—

- and cerebrospinal fluid pressure, 241.
- detection, dark adaptation values for use in, 855.
- effect on reproduction, 520.
- in commercial poultry flocks, 113.
- in cows, ocular changes, 520.
- in horses, 112.
- in man, consequences and detection, 394.

in poultry, Md. 231.

mechanical tests of, Hawaii 268.

deficient diets, effect of vitamin E on lesions of skeletal muscles from, 574.

foods, need for, Me. 691.

for poultry, shark-liver oil as source, Fla. 651.

importance in animal life and effect of its deficiency, 394, 529.

in bee bread, 228.

in blood of newborn calf, relation to calthood diseases, 520.

in cattle blood plasma, 233.

in cattle blood plasma on winter rations, 520.

in egg yolk, relation to ration, 806.

in fruits and vegetables, carotene analysis as basis of prediction, 854.

in green v. bleached vegetables, Miss. 556.

in milk and storage tissues of cows, relation to pasture and feeding practices, Ala. 523.

in milk from legumes and grasses, Idaho 809.

in oils, spectrophotometric and biological assay, 441.

in palm-kernel oil, 420.

in rat, intestinal absorption, 700.

in Winter Nellis pears, Wash. 556.

metabolism in humans, determined by rhodometer, R.I. 853.

potency, effect of treated fats on, 854.

requirement of chicks, Md. 231.

requirement of laying hens, West Wash. 518.

reserves of rat, effect of vitamin E deficiency, 573.

retention in glass-packed foods, 853.

status of children determined by dark adaptation, 132.

status of young adults, measurement by dark adaptation technique, 564.

storage in chicks, Md. 231.

storage in chicks, physiology of, 806.

studies with foxes, 384.

utilization, effect of quantity of basal food intake, 700.

value of Nancy Hall sweetpotatoes at harvest and after storage, Tenn. 556.

Vitamin B₁—*see also* Thiamin.

absorption from placenta, 133.

assay, improved method, 152.

bibliography, revision, 700.

deficiency disease in fox, analogous to Wernicke's disease of man, 672.

Vitamin B₁—Continued.

- determination, modified method, 8.
- determinations, 423.
- distribution in foods, 701.
- distribution in plant families, 701.
- effect on *Himeria nieschulzi* infection in rat, 667.
- effect on growth and yield of oats and tomatoes, 590.
- effect on ornamental greenhouse plants, Ohio 484.
- effect on woody plants for erosion control, 741.
- in beans, effect of cooking, 567.
- in peanuts, Ga. 855.
- in spinal fluid, 133.
- in yeast grown on molasses, Hawaii 268.
- large doses, effect on facial neuralgia 568.
- phosphorylation and adrenal cortex, 132.
- physiological activity and clinical use, 700.
- saturation in humans, proposed test for, 702.
- sparing action of fat for, test, 568.
- thiochrome method for estimation, 701.

Vitamin B₂—

- complex, B₁ and related factors of, 569.
- complex, choline as factor, 569.
- possible function in protein metabolism of plants, 170.

Vitamin B₃—

- and chick nutrition, 96.
- and related factors of vitamin B₂ complex in rats, 569.
- annotated bibliography, 703.
- borate complex formation, 583.
- deficiency—
 - dermatitis due to, 415.
 - in rat, epilepticlike fits of, 856.
 - in rat, role of unsaturated fatty acids in, 703.
- deficient diets, development and cure of ring-tailed rats on, 232.
- effect on *Himeria nieschulzi* infection in rat, 667.
- failure to improve growth of excised tomato roots, 318.
- hydrochloride, action and toxicity, 703.
- in foods, chemical estimation, 441.
- in rumen contents of livestock on vitamin-low diets, 94.
- quantitative response and specificity, effect of complementing factors, 569.
- treatment for neuritis, 138.
- treatment of cheilosis with, 423.
- urinary excretion of, 856.

Vitamin B complex—

- adequacy in American diet, effect of alcohol on, 422.
- and anterior pituitary, interrelation, 855.
- deficiency—
 - and thiamin deficiency, difference between, 422.
 - dysphagia ascribed to, 421.
 - in rats, skin changes in, 415, 856.

Vitamin B complex—Continued.

- deficiency—continued.
 - pathological conditions associated with, 566.
- distribution in meat and products, 132.
- factors in Russet Burbank potatoes, Idaho 855.
- filtrate factor B_w and anti-gray hair factor B_x, 704.
- filtrate fraction, effect of imbalance in dogs, 421.
- in nutrition, 132, 566.
- in yeast grown on media containing xylose, 132.

Vitamin C—see also Ascorbic acid.

- deficient guinea pigs, effect of vitamin P (citrin) on, 710.
- determination, protection against oxidation, 442.
- in apples, factors affecting, Va. 708.
- in frozen-pack boysenberries, Wash. 556.
- in frozen-pack peas, factors affecting, Wash. 556.
- in frozen-pack raspberries, Wash. 556.
- in fruit and vegetables of Ceylon, 570.
- in fruits and leaves of walnut, 570.
- in green v. bleached vegetables, Miss. 556.
- in milk and its relation to oxidized flavor, 394.
- in milk, new method of preserving, 524.
- in plant tissues, coexistence of oxidizing and protective mechanisms for, 705.
- in potatoes, 707, 708.
- in quick-frozen vegetables, effect of cooking methods, 571.
- in sea-buckthorn berries, 709.
- in tomato varieties, comparison, 708.
- in tomatoes, 571.
- in winter fruits and vegetables, Mont. 705.
- in Winter Nellis pears, Wash. 556.
- metabolism in humans, Ariz. 694.
- metabolism of preschool children, 801.
- nutrition, status in southern pediatric clinic, 136.
- nutritional status of college women, R.I. 853.
- preserving in milk, effect of deaeration, 659.
- protein-bound form, 861.
- renal retention, effect on saturation tent₄, 135.
- requirement of guinea pig, 709.
- retention in glass-packed foods, 853.
- role in Addison's disease, 424.
- role in nitrogen metabolism of plants, 169.
- synthesis in rat, effect of organic compounds, 861.
- tests on groups of poorly fed and well-fed school children, 571.

Vitamin D—

- assay by bone ash method, error of, 710.
- assay, chick method, 442.
- chemical nature and sources, 712.
- deficiency of dairy cattle, relation to mineral intake and sunshine, 519.

Vitamin D—Continued.

- effect on availability of phosphorus, 280.
- in blood serum, estimation, 572.
- in food substances containing phosphorus, determination, 710.
- in fresh leafy vegetables, 425.
- in milk, review, 660.
- intake, relation to age of infant at time of eruption of first tooth, 573.
- massive doses for rickets prevention in premature infants, 137.
- mode of action, 136.
- potency of milk, effect of exposing cows to sunlight, Ariz. 655, 694.
- requirement of dairy cattle, 519.
- requirement of ducklings, 98.
- requirements of turkeys, 590, Wash. 516.

Vitamin D₂ and D₃—

- excess, effect of dietary calcium and phosphorus, 573.
- potency in osteomalacia and rickets 711
- relative superiority, 712.
- spectrophotometric determination, 443.
- treatment for thyroid and parathyroid deficiency, 711.

Vitamin D₃—

- biological assay, 711.
- requirement of pullet chicks, 654.

Vitamin E—*see also* Tocopherol.

- assimilation by chicks, factor in cod-liver oil hindering, 807.
- biological significance, 138.
- deficiency, effect on vitamin A reserves of rat, 573.
- deficiency in goats, effect, 394.
- deficient chicks with encephalomalacia cholesterol in brain of, 673.
- deficient rats, tremors and incoordination of, 712.
- fate in animal body, 138.
- in livestock and poultry feeds, Iowa 231
- low rats, successive generations, 36.
- oxidation, 153.
- prevention of edema in chicks by. Md. 231.
- relation to reproduction of swine and sheep, Iowa 231.
- relation to sterility in cows, Iowa 238.
- role in animal nutrition, 385.
- symposium, 573.
- therapy in certain neurologic disorders 574.
- treatment of muscular dystrophies and allied conditions, 426.

Vitamin G, *see* Riboflavin.

Vitamin K—

- activity of naphthoquinones, 139.
- analogs, effect on prothrombin level in newborn infants, 139.
- and sweetclover disease, 106.
- assays for a number of compounds, 427
- bibliography and supplement to, 713.
- deficiency, effect on gizzard erosion in chicks, 255.
- deficient diets, new type, 714.
- effect on hypoprothrombinemia of experimental liver injury, 428.

Vitamin K—Continued.

- for pediatrician, history, sources and mode of action, 140.
- for treatment of hemorrhagic disease of newborn, 715.
- in man, nutritional deficiency, 714.
- in rumen contents of livestock on vitamin-low diets, 94.
- in treatment of hemorrhagic diseases of newborn, 141.
- newer knowledge, 279.
- potency of 2-methyl-1,4-naphthohydroquinone, 139.
- requirements of hens, Wis. 516.
- studies, 807.
- synthetic, in treatment of hypoprothrombinemia, 715.
- water-soluble, absorption from intestinal tract, 427.
- water-soluble, absorption without aid of bile salts, 574.

Vitamin K₁—

- and 2-methyl-1,4-naphthoquinone, potencies, 427.

- K₂, and related compounds, biological activity, 714.

Vitamin K₂, constitution, 583.

Vitamin P—

- effect on vitamin C-deficient guinea pig, 710.
- in vascular purpura, 574.

Vitamin(s)—

- and hormones in cosmetics, 131.
- and senescence, 855.
- antihemorrhagic, *see* Vitamin K.
- antineuritic, *see* Vitamin B₁.
- antirachitic, *see* Vitamin D.
- chemistry and technology, 7.
- deficiency and mineral deficiency, non-identity of gray hair produced by, 423.
- deficiency, experimental, in man, 130.
- in peanuts, 740.
- in rumen content of livestock fed vitamin-low diets, 94, 384.
- in vegetables used by Filipinos in Hawaii, assays, Hawaii 268.
- in wines, Calif. 5.
- requirements of older people, Mass. 845.
- research, importance of micro-organisms in, 741.
- review, 130.
- therapy, recent advances in, 130.

Volucella sp. notes, Kans. 84.

Vultures, turkey, feeding at dens of northern plains red fox, 500.

Wallace, H. C., biographical sketch, 121.

Walnut(s)—

- bacterial blight, new spray for, Calif. 65.
- black, chemical composition. 723.
- black, storage, U.S.D.A. 411.
- blanching, 299.
- blight control in Oregon, 370.
- caterpillar, life history and control, Okla. 224.
- husk fly, control, 217, Calif. 83.
- husk fly, lures for, 502.

Walnut(s)—Continued.

- meats, peeling, lye process for, Calif. 5.
- Mn requirements, Calif. 52.
- N fertilization, Calif. 52.
- Persian, development of cotyledons in, 169.
- Persian, storage, U.S.D.A. 411.
- sclerotial seedling blight, U.S.D.A. 768.
- vitamin C in fruits and leaves, 370.
- War and agricultural adjustments, 548.
- War and nutrition, 270.
- Warren, G. F., biographical sketch, 121.
- Washing machines, sale, installment credit in, [N.Y.]Cornell 285.
- Washington College, notes, 144, 576, 720.
- Washington Station, notes, 144, 576, 720.
- Washington Station, report, Wash. 575.
- Wasps, sand, breeding of *Craticulina tabaniformis* in nests of, 85.

Water—

- and soil conservation studies, 17, 257, Iowa 160, U.S.D.A. 165.
- and soil losses, Idaho 729.
- application by sprinkler systems, uniformity, 543.
- drinking, fluorides in, 129.
- drinking, of cows, fluorides in, effect on milk, Ariz. 694.
- duty of, *see* Irrigation water.
- evaporation from soils, Calif. 115.
- facilities area planning handbook, U.S.D.A. 258.
- facilities procedure manual, U.S.D.A. 258.
- ground, hydraulics, status of knowledge, 302.
- ground, motion, theory of, 302.
- ground, rate and cause of rise in Mesilla Valley, N.Mex. 258.
- in soil, flow and distribution, Iowa 160.
- infiltration into soil, factors affecting 164.
- irrigation, *see* Irrigation water.
- levels in observation wells in United States, 542.
- of constitution of typical soils and relation to parent rock material, 14.
- pasture, studies, Fla. 609.
- percolation and soil aggregation in Salt River Valley, Arizona, 731.
- relations of plant cells, 27.
- resources of Lufkin area, Texas, 542.
- resources of river basins, inventory and history, Nev. 542.
- saline and alkaline, use in greenhouse, 484.
- sprays for citrus, use, Calif. 83.
- spreading, soil changes accompanying Ariz. 589.
- storage, proposed, in Flathead Lake, Montana, effect on ground-water levels, 543.
- studies in various districts, Ariz. 675.
- subsidence data, Fla. 675.
- supply, forecast accuracy of, from snow surveys, 159.
- supply, forecasting, Ariz. 675.

Water—Continued.

- supply, forecasting, problems of division of irrigation, 587.
 - supply of United States, 406.
 - supply of Washington, summary of records, 543.
 - supply, relation to surface taint in butter, 396.
 - table, deep, in Great Plains, ground-water recharge in, 302.
 - weevils associated with rice root rot, La. 772.
- Waterfowl—
- breeding areas, distribution and ecology of plants in, Iowa 171.
 - living, removing lead from gizzards, 405.
 - Maine, blood parasites of, 405.
- Watermelon(s)—
- diseases, control, Fla. 629.
 - disease-resistant strains, breeding and selection, Iowa 205.
 - fertilizer tests, La. 762.
 - Fusarium* wilt, notes, Tenn. 487.
 - irrigation studies, 349.
 - seed treatment, Calif. 65.
 - varieties, new, Calif. 192.
 - variety tests, La. 762.
 - wilt-resistant, breeding, Calif. 49.
 - wilt-resistant, on infested soils, testing, Iowa 190.
 - wilt-resistant varieties, Tenn. 75.

Watershed(s)—

- and forest fires, Utah 204.
- mountain, forest influence on, Calif. 115.

Weather—*see also* Meteorological observations and Meteorology.

- and sun, variation of, 12.
- character of, 301.
- conditions of Kansas, 315.
- crises, recurrent, 444.
- effect of rotational properties of earth, 728.
- effect on crop yields, climograph for study, 729.
- forecasting and work of U. S. Weather Bureau, 585.
- forecasting, local, climatological aids, 585.
- forecasting, long-range, critical studies of methods, U.S.D.A. 11.
- freak, damage to trees and shrubs, 729.
- observations, remote automatic, 12.
- relation to pressure and temperature-gradients, 728.
- world, possible relation to planetary configurations and sunspots, 586.

Webworm(s)—

- beet, life history and control, Mont. 646.
- injury and treatments, R.I. 787.
- sod, notes, 499, Iowa 218.
- sugar beet, in Montana, Mont. 507.

Weed(s)—

- chlorine gas injury, 208.
- control, 481, Calif. 40, Kans. 41, Miss 41, Nev. 472.

Weed(s)—Continued.

- control in cranberry bogs, 196, Wash. 471.
- control, sodium chlorate treatment, Colo. 761.
- control with Sinox, Calif. 40.
- distribution in Kansas, recent migrational trends, 336.
- in small grain, control, Wis. 472.
- lawn, control, Ohio 616, Utah 618.
- of Colorado, Colo. 616.
- seeds, germination, Iowa 182.
- Weevils, control with zinc-safened calcium arsenate, Miss. 502.
- Wells, observation, water level or artesian pressure in, 542.
- Western Washington Station, report, 575.

Wheat—

- barley, oats, and rye, comparison of yields, Tenn. 470.
- black stem rust, Ariz. 628.
- boron in, Ky. 852.
- breeding, Ariz. 608, Del. 40, Idaho 751, Iowa 182, Kans. 40, Md. 182, N.Mex. 183, Wash. 471.
- breeding for disease resistance in, Kans. 65.
- breeding for insect resistance, 789.
- breeding for local adaptation and disease resistance, Tenn. 487.
- breeding, objectives in, 175.
- bunt, *see* Wheat smut, stinking.
- combined resistance to leaf and stem rust races, Kans. 65.
- condition in Kansas, spring of 1941. U.S.D.A. 357.
- cooperative rod-row tests. N.Dak. 476.
- cross, new amphidiploid, 327.
- culture experiments, Kans. 40, Wash. 471, Wyo. 43.
- disease-resistant, developing, Calif. 65.
- diseases, Kans. 65.
- diseases, estimated reduction in yield from, U.S.D.A. 769.
- durum, blight and other damage, effect, N.Dak. 70.
- Elgin, merits of, Idaho 751.
- embryos, cytochrome oxidase in, 169, 742.
- failure, frequency, relation to fallow, Kans. 754.
- fallow methods for, Kans. 753.
- farms, dry-land, land use and production costs, Oreg. 549.
- feeding to beef cattle, 385.
- fertilizer tests. Kans. 40, [N.Y.]Cornell 610, Tenn. 471, Wyo. 43.
- field infestation by insects attacking in farm storage, 376.
- flag smut, notes, U.S.D.A. 768.
- formation of vegetative and generative organs in, under slow development, 459.
- from seed of different weights and origin. analysis of yield, 760.

Wheat—Continued.

- germ oil as supplement to poultry rations, specificity, Iowa 281.
- germ oil in control of fowl paralysis and kindred diseases, 664.
- germ oil treatment of muscular dystrophies and allied conditions, 426.
- germ, vitamins in, 453.
- germination and early growth, effect of treatment with various substances, 598.
- glumes and paleae in, structural peculiarities, 459.
- growing, freezable water and oxygen respiration in, 170.
- growth and reproduction, X-ray effects, 453.
- growth and yield, relation to environment, Kans. 40.
- improvement, Okla. 47.
- in post-surplus period 1900-09 with recent analogies, 265.
- in rotation, effect of tillage and green manure, Wyo. 43.
- in rotation, response to fertilizers, Ky. 751.
- in world agriculture and consumption, 681.
- insects, studies, Iowa 218, Kans. 84.
- irrigation tests, Ariz. 181.
- kernel and vitaminisation, 131.
- leaf rust, in North Dakota, N.Dak. 771.
- leaf rust, *Triticum* spp. and related grasses as hosts, 359.
- loans in Oklahoma and United States, Okla. 677.
- lodging, relation to nutrients, Ariz. 608.
- milling and baking quality, effect of green grain bug, N.Dak. 506.
- milling and baking quality, varietal factors, Kans. 41.
- minerals, role in nutrition, 851.
- nematode in Georgia, U.S.D.A. 628.
- nitrogen carriers, tests, Del. 40.
- nursery-grown varieties and hybrids, protein and carotene determinations on, Kans. 40.
- oxygen respiration, relation to water, Md. 168.
- pigment formation in glumes and kernels, 456.
- powdery mildew in spring, source of inoculum, 359.
- production in Oklahoma. Okla. 681.
- production, winter, value of furrow drill in, Wyo. 115.
- protein content, Idaho 729.
- quality during farm storage in different types of bins, Kans. 41.
- quality, factors affecting, Kans. 5.
- quality, inheritance studies of factors affecting, Kans. 40.
- rhizosphere, effect of organic amendments on microflora of, 208.
- root-rotting fungi in, control by seed disinfection, 360.

Wheat—Continued.

rust(s)—*see also* Cereal rust(s)
Rust(s), Wheat leaf rust, and Wheat stem rust.

early spring incidence in Texas, U.S.D.A. 204.

resistant variety, for India, 71.

rye hybrid, restitution of fertility in, 462.

seed, durum and hard, effect of blights and other damage, 70.

seedbed preparations, Kans. 40.

seedling(s)—

blight and soil conditions, 208.

chlorophyll in, effect of vernalization, 173.

development, effect of day length and temperature, 323.

etiolated, effect of cooling on rate of greening, 173.

greening, role of sugar in, 324.

rate of greening, effect of endosperm, 457.

Septic larvae attacking, 217.

smut(s)—*see also* Smut.

and rust resistance, inheritance of, Wash. 471.

notes, Wash. 487.

rates and resistance of varieties to, N.Dak. 208.

stinking, in Oregon and Washington, U.S.D.A. 768.

species, activity and quality of amylase in grain of, 453.

spike, assimilatory tissue in, distribution and structure, 459.

spring—

hard red, test weight, determination, N.Dak. 286.

heat and drought tolerance in, Kans. 40.

phosphate nutrition, time factor in, 343.

uptake of nutrients, effect of humidity, 320.

uptake of nutrients, effect of soil temperature, 171.

varieties at Mandan Station, N.Dak. 189.

variety tests, Idaho 751, Kans. 40, N.Mex. 753, Wash. 471, Wyo. 43.

starch, fractionation and amylase hydrolysis, 580.

stem rust control, 488.

stem rust in crosses with Kenya varieties, inheritance of resistance to, 462.

stem rust in Oklahoma, U.S.D.A. 628.

stem rust, pathogenic characters, Mendelian inheritance, 326.

stored, protecting against insects, Okla. 505.

straw, increasing feeding value, 651.

strawworm, Kans. 84.

stripe rust fungus, physiological studies, 491.

surplus, feeding experiments and demonstrations, Oreg. 802.

Wheat—Continued.

take all disease, and soil conditions, 208.
take-all fungus, relation to high soil moisture, 359.

temperature in bins of various construction, N.Dak. 261.

temperatures in farm-type storages, U.S.D.A. 546.

Thatcher, grown in soilless culture, quality, N.Dak. 476.

top dressings, comparison, Ind. 751.

varietal resistance to hessian fly, 490.

varieties, important, N.Dak. 47.

variety tests, Ariz. 608, Ind. 751, Iowa 182, Md. 182, Me. 609, Miss. 337, N.Mex. 183, S.C. 42, Tenn. 470, Wyo. 43.

vitamin B₁ in thiochrome method for estimation, 701.

wcevils, control, 91.

winter—

and soil moisture in Kansas, 336.

effect of soil moisture, Kans. 753.

hardness, carbohydrate metabolism, 343.

heat and drought tolerance in, Kans. 40.

hessian fly resistance in, Kans. 84.

variety tests, Idaho 751, Kans. 40, N.Mex. 753, Wash. 471, Wyo. 43.

yield, relation to seasonal distribution of rainfall, U.S.D.A. 189.

world survey and outlook, 548.

yields—

effect of artificial defoliation, Kans. 65.

effect of bindweed, Kans. 41.

effect of calcium carbonate with rock phosphate, Ky. 751.

effect of fallow, Kans. 753.

effect of fallow and wind erosion control, Kans. 40.

effect of soil management and crop rotation, Idaho 751.

effect of storage of treated seed, Ill. 360.

in Punjab, factors affecting, 738.

notes, N.Dak. 42.

relation to precipitation, Idaho 751.

Wheatgrass, crested—

and slender, as dry-land pasture crop, Mont. 473.

breeding, Wash. 471.

culture experiments, Wyo. 43.

sod formation studies, Idaho 751.

yields, effect of shelterbelt, Wyo. 43.

Whey—

drying by roller process, 814.

fat content, methods for determining, Idaho 809.

mash, effect of feeding on cecal coccidiosis and leucosis, West.Wash. 539.

mixtures, drying on atmospheric drum drier, 103.

Whipworm, giant toad as vector of in Puerto Rico, 82.

- White grub(s)—
 control, sand-arsenical mixtures for, 791.
 cor col, soil treatments for, Ky. 786.
 destroying cactus plants as aid in range
 improvement, Colo. 512.
 distribution, Ky. 786
 in legumes, Wis. 503.
 on wheat, Kans. 84.
 studies, Iowa 218.
- White pine—
 blister rust—
 control, 498, Iowa 203.
 developing resistance to, 80.
 studies of red currants, 780.
 work, method of sampling, 373.
 cuttings, rooting, effect of indoleacetic
 acid in, 169.
 effect of drought, 627.
 in West Virginia, addition to range of,
 63.
 plantings near cultivated red currants,
 relation to blister rust, 637.
 propagation, 485.
 root and butt rot, Mich. 216.
 western type, natural regeneration in,
 U.S.D.A. 625.
- White-fringed beetle—
 ethylene dichloride for, Ky. 786.
 on alfalfa in Australia, 91.
- White-spotted sawyer, damage to dead conif-
 erous timber, 792.
- Whitetop control, Nev. 472, Wash. 471.
- Whitney, E., biographical sketch, 121.
- Whitney, M., biographical sketch, 121.
- Wildlife—
 brucellosis in, 817.
 conservation, treatise, 81.
 food plants in New England, 315.
 in Canada, possible effects of arthropod
 parasites, 374.
 introductions in Alaska, 500.
 management through soil conservation on
 farms, U.S.D.A. 500.
 of Atlantic coast salt marshes, 639.
 protection, Federal laws relating to, 639.
 protection, officials and organizations
 concerned with, 639.
 refuge lands, national, acquisition under
 Migratory Bird Conservation Act, 639.
 restoration, Federal aid in, 639.
- Willow, primrose, insects from seed pods of,
 86.
- Wind(s)—
 chinook, east of Canadian Rockies, 303.
 in upper troposphere and lower strato-
 sphere over United States, U.S.D.A.
 12.
- Windbreaks, *see* Shelterbelt(s).
- Wine(s)—
 enzymic darkening, 301.
 musts, ameliorated, fermentation, 301.
 new types, Calif. 5.
 vitamins in, Calif. 5.
 white, clouding, Calif. 5.
- Wire and fencing, atmospheric exposure tests
 of, Iowa 257.
- Wiregrass pasture, annual burning during win-
 ter months, Fla. 609.
- Wireworm(s)—
 control, crop rotations for, Idaho 786.
 control on irrigated lands, U.S.D.A. 513.
 eastern field, control, Conn.[New Haven]
 786.
 injury to tobacco, Ky. 786.
 on wheat, Kans. 84.
 studies, Fla. 642, Wash. 503.
 studies in potato rotation systems, 513.
 sugar beet, life history, habits, and in-
 jury, U.S.D.A. 512.
- Wisconsin Station, notes, 720.
- Wisconsin Station, report, Wis. 575.
- Wisconsin University, notes, 720.
- Withania coagulans*, milk clotting enzyme of,
 395.
- Wohlfahrtia*—
evittata, parasite of brown locust, 86.
opaca fatal to kit mink, 502.
- Wollny, E., pioneer in soil and water con-
 servation research, 160.
- Women, colleg
 nutritional status related to dietary
 habits, cooperative project on, Iowa
 268.
 vitamin C nutritional status, B.I. 853.
- Wood—*see also* Lumber and Timber.
 and wood technology, literature of, Minn.
 717.
 ashes, synthetic, boron requirements,
 504.
 butanolysis, Minn. 581.
 cell walls, penetration by wood-destroy-
 ing fungi, 374.
 collapse in, 485.
 compression, detecting, new method, 485.
 destruction by *Fomes* spp., 81.
 penetration, electrokinetics and mech-
 anism involved, Minn. 828.
 products of south Georgia and future
 outlook, U.S.D.A. 62.
 rosin, potassium soaps of, 504.
 structure of South American species of
Strychnos, 325.
 tick, Rocky Mountain, and tick borne
 diseases, 666.
 using industries of Virginia, 204.
- Woodchuck—
 attacked by black flies, 379.
 hibernating gland, androgen in, 38.
- Woodlands, oil injury to, 498, 788.
- Woods trash, insects and spiders on, U.S.D.A.
 501.
- Woody—
 herbarium specimens, preparation of
 stem sections, 325.
 plants, *Clitocybe* mushroom rot of, Fla.
 629.
 plants, damping-off and growth of seed-
 lings and cuttings, Mass. 769.
 plants for erosion control, effect of vita-
 min B, 741.
 plants, mineral nutrition, Iowa 201.

- Woody—Continued.
plants, planting for wildlife food and shelter, R.I. 500.
plants, *Verticillium* wilt of, 372.
- Wool—
density, methods of determining, Utah 95.
fibers, projecting and measuring cross sections, U.S.D.A. 142.
fineness and variability in, determination, 382.
finishes, protection from degradation with, Iowa 283.
production by ewes bred to rams of different breeds, Miss. 517.
production from rams and ewes of different breeds of range sheep, N.Mex. 231.
scouring tests, Utah 716.
- Wound(s)—
healing, theoretical and practical aspects, 172.
hormones of plants, 599.
infected, sulfanilamide solutions for, 667.
Wyoming Station publications, index, 864.
Wyoming Station, report, 143.
- Xanthippus corallipes pantherinus*, false stability in living nymphs of, 88.
- Xanthophyll in egg yolk, relation to ration, 506.
- Xenopsylla cheopis*, see Rat flea, oriental.
- Xestobium rufovillosum*—
biology, 645.
injury to Old South Meeting House in Boston, 702.
- X-ray(s)—
and radium burns, curative properties of aloe, 595.
differential sensitivity of cells to, 324.
effect on wheat growth and reproduction, 458.
irradiation, effect on biological substances, Iowa 205.
irradiation of dry seeds by, effect on seedling roots, 745.
- Xylaria* rot of potatoes, control, Fla. 620.
- Xylosandrus germanus*, experiments with, 792.
- Xylosandrus germanus*, life history and habits, 227.
- Yarns and fabrics, compressional creep and creep recovery, 430.
- Yeast(s)—
associated with *Dendroctonus* spp., 782.
brewers', and fodder for laying pullets, 505.
cell division, 32.
cells, effect of ultraviolet light, 324.
distillers', fermentation rate, effect of concentrations of ethyl alcohol, 33.
effect of carcinogens on, 25.
grown on media containing xylose, vitamin B₁ and B₂ in, 132.
grown on molasses, vitamin B₁ content, Hawaii 268.
growth-depressant substance from, 740.
irradiated dry, effect of feeding to dairy cows, Mass. 809.
nutrients, importance of amino acids as, 322.
pantothenic acid in, 412.
staining with acid dyes, 326.
strain in grain wort, effect of copper on growth, 32.
studies, Calif. 5.
- Yellow fever—
and work of Carlos Finlay, 647.
mosquito, control with *Gambusia holbrooki*, 797.
- Yellow-necked caterpillar, studies, Iowa 218.
- Yew cuttings, dormant, rooting, 354.
- Youngberry(ies)—
adaptability tests, Hawaii 100.
canker and dieback, Idaho 709.
- Youth problem in Utah, Utah 690.
- Zamia* leaf, structure and development, 169.
- Zinc—
deficiency(ies)—
effect on cells of vegetative buds, 367.
in crops, symptoms and diagnosis, 66.
of avocado, 368.
effect on alkaline phosphatases, 582.
methods of applying to fruit trees, 215.
relation to carbonic anhydrase, 583.
relation to plant growth, 172.
- Zoological sciences, need for standard classification in nomenclature, 401.
- Zythia resinac*, perfect stage of, 171.

